COMPUTER PROGRAMMING FOR KIDS AND OTHER BEGIN

THE COMPUTER SHOP
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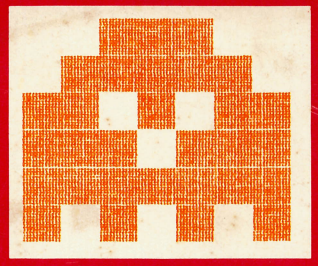
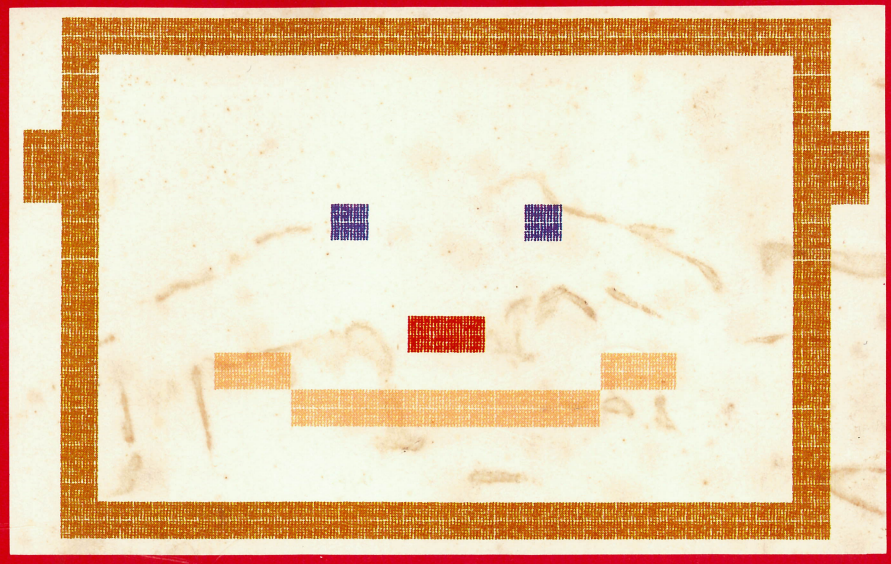
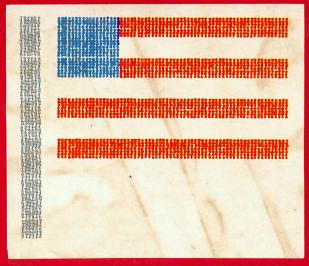
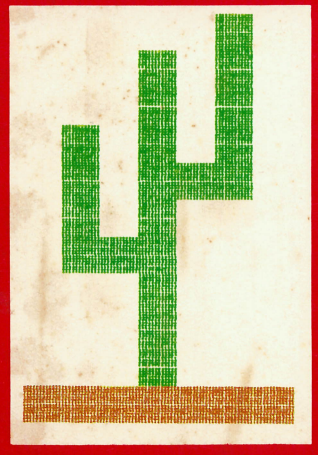
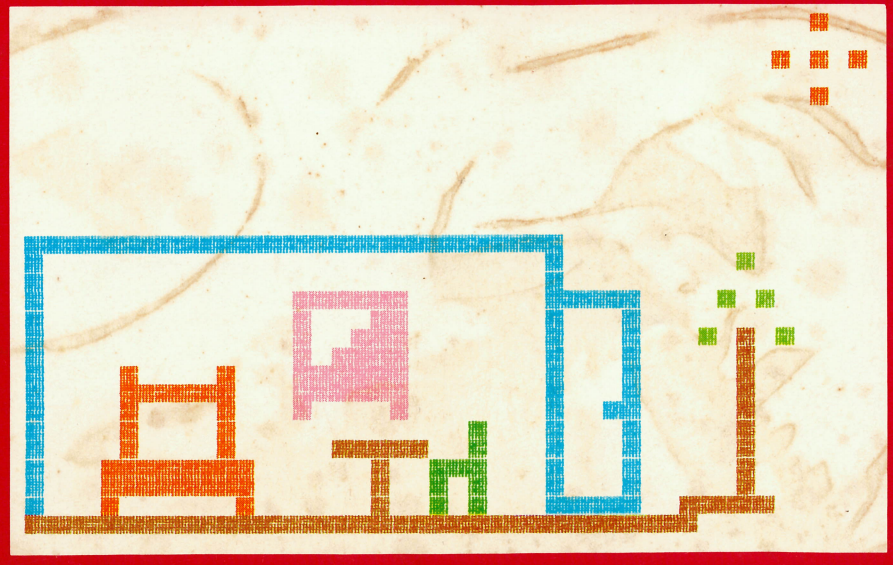
APPLE II Edition

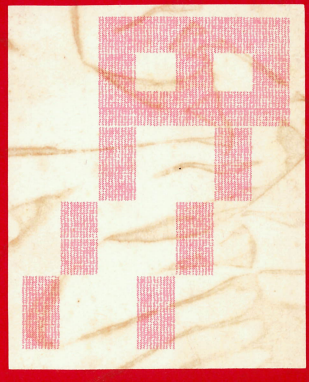












BY Royal
Van Horn

COMPUTER PROGRAMMING
for
KIDS AND OTHER BEGINNERS

APPLE II Edition

by
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To Hilary, Michael, and Sharon for their love, encouragement, and the time I stole from them; to Dr. John Minahan for establishing an environment that makes projects like this possible; and to Sterling Swift for his faith in me and his conviction that computers **are** for people.

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How To Read This Book

1. Read this book with a friend. That way you can help each other.
2. The important words in this book are in capital letters. RUN is an example. Keep a notebook for these words. Or, underline them as you read. Try to remember the words in capital letters!
3. You might find a page that's hard to read. Read hard pages two or three times.

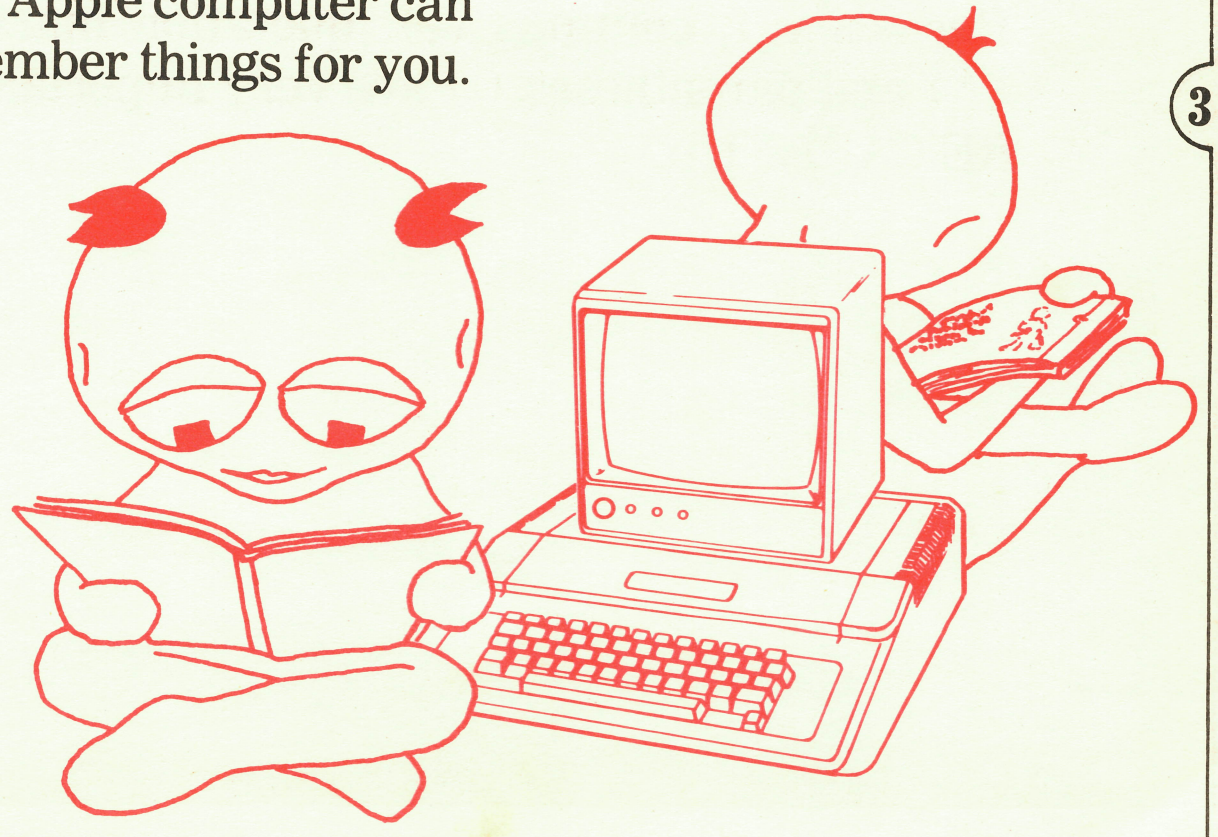
NOTES:

chapter
1

Good News And Bad News

First, the good news. The Apple computer can do "graphics" in color! That means it can draw pictures. Many computers cannot do this. You can "program" it to do graphics. This book will teach you how.

Like all computers, the Apple computer can do math. It can also remember things for you.



It could remember all your grades. It could remember your friends' telephone numbers. It could even play games with you. You can learn to make it do these things.

Now the bad news. Spelling is important. You must be very careful. Words must be spelled right. Punctuation is also important. Periods (.), commas (,), quotation marks (") and parentheses ( ) are very important. **BE CAREFUL.**

Be careful of spelling!

All About The Apple Computer

chapter 2

The computer has five parts.

1. **The Keyboard** This part looks like a typewriter. You type on it. Then you push the RETURN button. This sends your message to the CPU. The message is called "input."

2. **The CPU** CPU stands for "central processing unit." The CPU is the brain of a computer. You cannot see it. It is inside the machine. The CPU takes your "input" and "processes" it. That means it uses it. The CPU can only understand certain words or commands. These commands are stored in ROM.

3. ROM

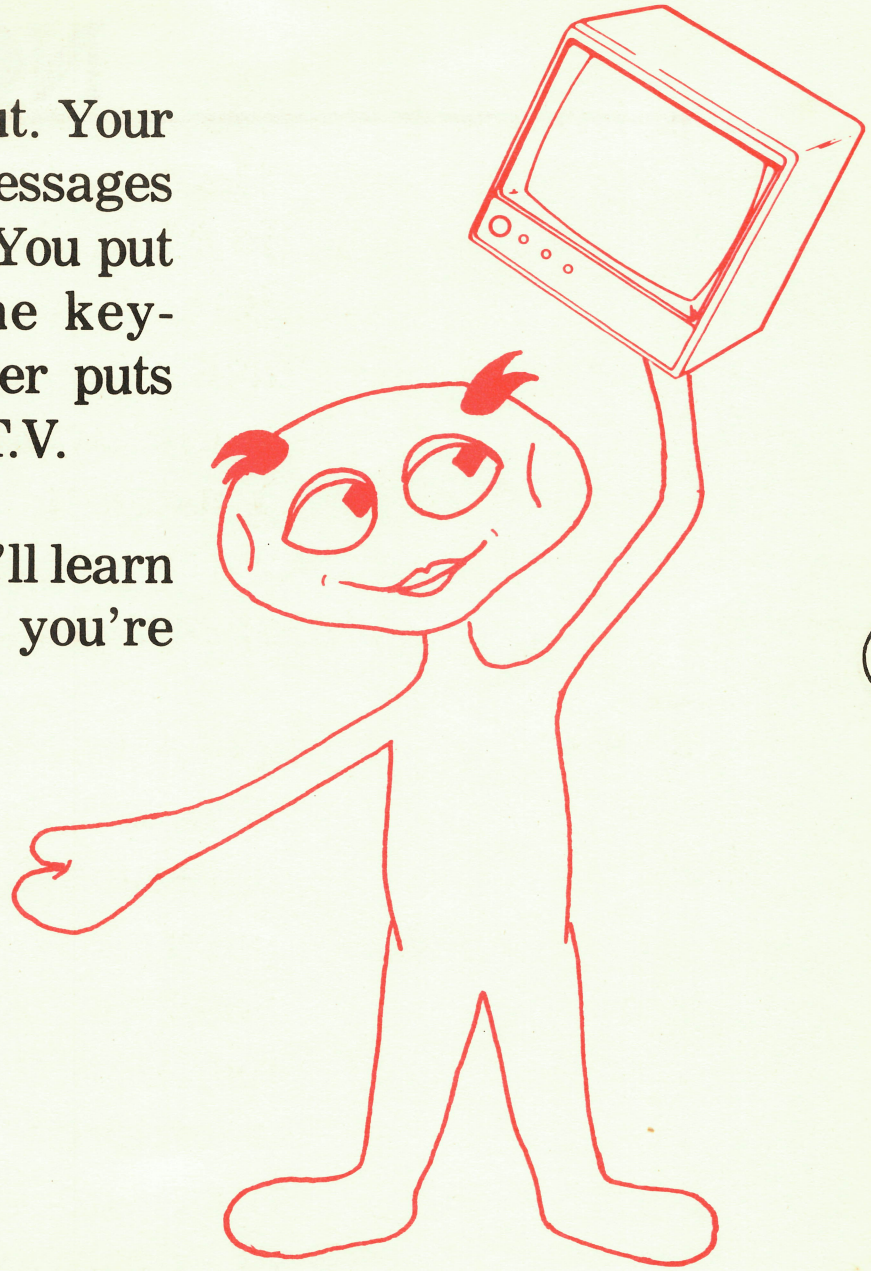
This stands for Read Only Memory. You cannot change ROM. ROM contains BASIC. BASIC is a computer language. You must use BASIC words to use the computer. You cannot use English words. The computer speaks BASIC, not English.

4. RAM

This stands for Random Access Memory. It is like a notebook inside the computer. You write on it when you type. You can erase it, too. BASIC words must be used to do this. When you turn the computer off, everything in RAM is erased.

5. T.V. Screen The T.V. is for output. Your computer prints messages on the T.V. screen. You put things in using the keyboard. The computer puts them out using the T.V.

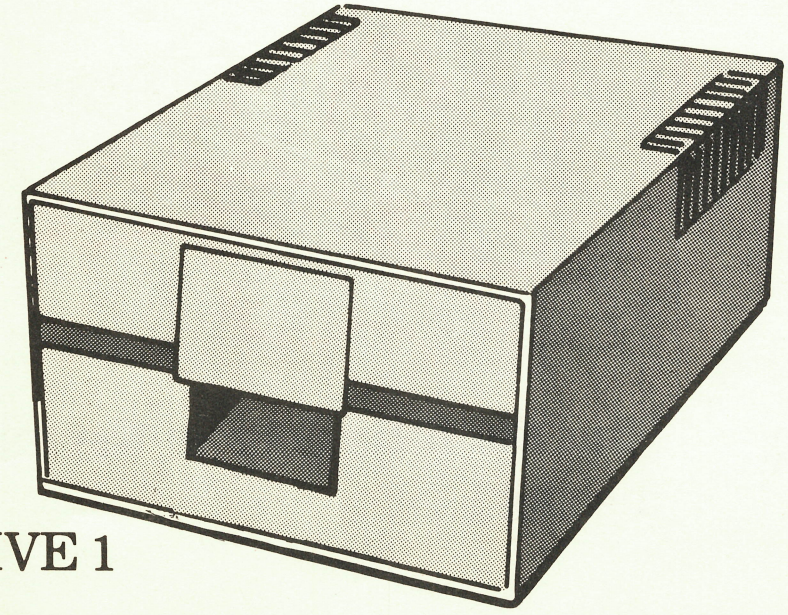
Your computer has other parts. You'll learn about these other parts later. Now you're ready to start learning to program!



NOTES:

Getting Started

Turning the Apple computer on is easy. **First,** turn the T.V. on. Let it warm up. **Second,** does your computer have a disk drive? A disk drive looks like this.

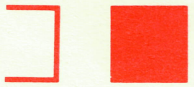


DRIVE 1

Read this—if you do **not** have a disk drive.

Third, turn the computer on. The switch is on the back of the computer. It is on the left side. The computer should print this on the T.V.

APPLE II



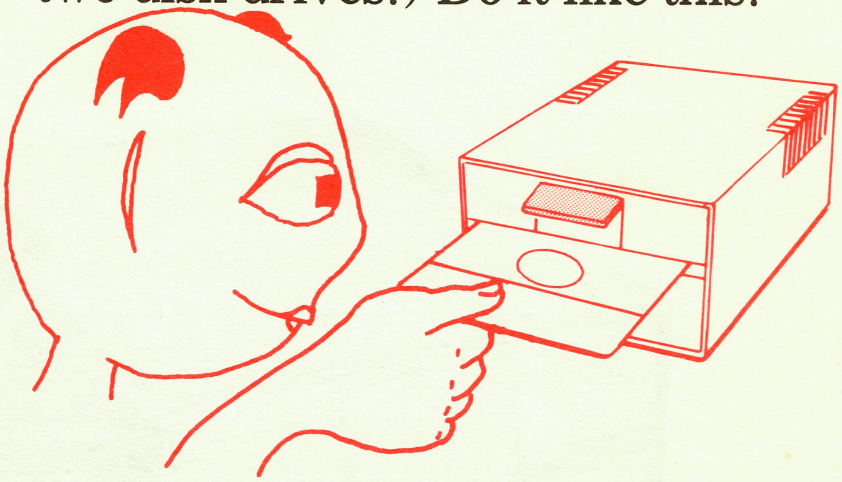
If you don't get this, check the switches. Both the T.V. and the computer must be on.

To turn off the computer, turn off both switches.

Skip the next page. You don't need to read it.

Read this—if you **have** a disk drive.

Third, find the disk marked SYSTEM DISK. Take the disk out of its paper holder. Hold the label end of the disk. Do **not** touch the other parts of the disk. **Slowly** and **gently** put the disk in DRIVE 1. (Some computers have two disk drives.) Do it like this.



Shut the little door in the middle of the slot.

Fourth, now turn the computer on. The switch is on the back of the computer. It is on the left side. The red light on the disk drive should come on. Then the computer should print something on the T.V. It will look about like this.

APPLE II
DOS VERSION 3.__ DATE
APPLE II PLUS ON ROM CARD

If you don't get this, check the disk. It must be in right to work.

To turn off the computer, turn off both switches. Then put the disk back in its holder.

SHORTCUT: You don't need the disk on most Apples. Just:

1. Turn the computer on
2. Hold down the CTRL button and push RESET

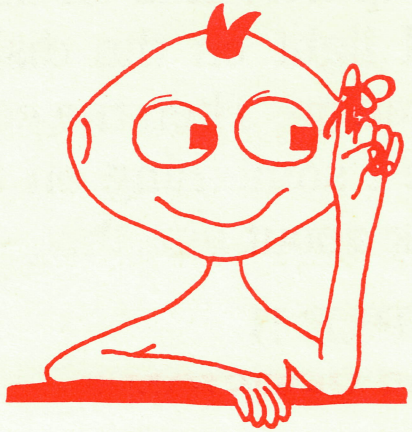
Typing

The blinking box on the T.V. is called a **cursor.** The cursor means it's your turn to type. The cursor also tells where the next letter will go. Now type something. Type anything. Try all the letters and numbers.

When you're done typing push the RETURN key. This sends what you typed to the computer. The computer should print:

SYNTAX ERROR?

This means the computer doesn't understand what you typed. The reason is simple. You didn't use a BASIC word. Remember, the computer only understands BASIC words. Soon you will learn some easy BASIC words. But first here are some hints.



Things to Remember

■ means it's your turn to type.

RETURN sends what you typed to the CPU.

Hint One: The SHIFT key

Look at the keys. Find the things that are on top of some of the keys. To type these, you must **hold down** the SHIFT button. This is true for anything on top of the key. Practice typing the things on top of the keys. Take time to do this now. Don't worry if the computer prints SYNTAX ERROR.

Hint Two: Ø and O, 1 and L

The zero on this computer has a line through it. It looks like this Ø. Zeros and Ohs are different. Don't confuse them. Type a few of each. See how they look. 1 and L are also different. But, they look the same. Type a few of these also.

Things to Remember

To type some things you must use the SHIFT key.

Zero (Ø) and Oh (O) are different.
One (1) and L are different.

HOME

Push RETURN. Then type HOME. Then push RETURN again. Do this now. HOME erases the T.V. screen. But, it does **not** erase memory. It is very handy though.

NEW

To erase the computer's memory, type NEW. Then push RETURN. Do this now. This erases old programs. Always start out with a clean memory.

Be Careful

Don't turn a computer off and on quickly. This can hurt a computer. Wait 10 seconds between off and on.

Things to Remember

Type HOME to erase the screen. HOME does **not** erase memory.

Type NEW to erase the computer's memory. Always start with a clean memory.

Programs

chapter 4

Computers don't know anything. You might even say they're dumb! But, they can learn. When you teach a computer, you program it. A program tells a computer what to do. It also tells it how to do it. You must tell computers everything. To do this you program.

A program is made up of lines. Each line tells the computer to do something. Lines in a BASIC program have line numbers. That way the computer knows what to do first.

BASIC program lines are numbered by fives and tens. This is done so lines can be added later. Between 5 and 1Ø there are four numbers. You could add four lines between 5 and 10.

You could add lines 6, 7, 8, and 9 here.

```
5 HOME

1Ø COLOR=4
```

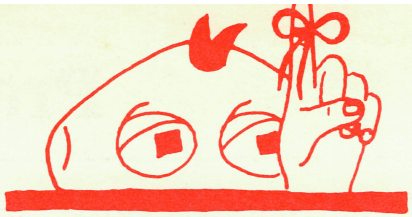
Things to Remember

Number program lines by fives or tens.

Here is your first program. Type the first line and check spelling. Fix mistakes with the ← key. Then push the **RETURN** button. **Do this for all four lines.** Then you can type RUN to see it work. This program will light 1 block on the T.V. Soon you'll light lots of blocks.

Type This	Check Spelling Then Push	Read This
NEW	**RETURN**	NEW erases the computer's memory.
Ø5 GR	**RETURN**	GR tells the computer it will use the T.V. for graphics.
1Ø COLOR=1	**RETURN**	COLOR= tells the computer to use color 1, red.

(There's more on the next page.)



Things to Remember

The ← key is used to fix mistakes.

RETURN sends what you type to the computer.

NEW erases memory.

GR tells the computer to use the T.V. for graphics.

COLOR= is used to tell the computer a color.

15 PLOT 2Ø, 2Ø **RETURN**

PLOT lights a small block on the T.V.

R U N

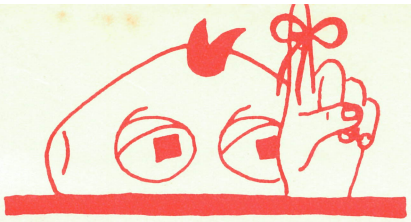
RUN tells the computer to do your program.

Did you get a red block on the T.V.? If so, then G-R-E-A-T! If not, don't worry. It's probably a typing mistake. We'll talk about fixing mistakes in a minute.

Where did the program go? It's in RAM. To look at it you must do three things. **Do these now**

1. Type TEXT and push **RETURN**. This tells the computer you want to use the T.V. for words.
2. Type HOME and push **RETURN**. This clears the screen—remember?
3. Type LIST and push **RETURN**. This gets your program from RAM.

Now your programs should be on the T.V. If it isn't — repeat steps 1, 2, and 3.



Things to Remember

PLOT lights one block.

RUN tells the computer to do your program

TEXT tells the computer to use the whole T.V. for words.

HOME clears the screen.

LIST gets a program from RAM.

Typing Mistakes

1. Easy Fix One

Typing mistakes are easy to fix. **Always** check your typing before you push RETURN. Use the back arrow ← key to fix mistakes.

2. Easy Fix Two

You can**not** fix mistakes after you push RETURN. You have to retype the whole line. It is easy. Just use the same line number.

3. Erasing Lines

To erase a line, just type the line number. Then push RETURN.

Things to Remember

Check spelling before you push RETURN.

← key is used to fix mistakes.

You can retype a whole line to fix it.

Typing only a line number erases that line.

Adding Lines to a Program

Is your last program in the computer? Type LIST to see. If not, go back and type it in.

You can add lines to a program. Just use a **new** line number.

Type these two lines. Do this now.

20 PLOT 0, 0 push RETURN
25 PLOT 39, 39 push RETURN

Now type LIST, then push RETURN again. Do you see the new lines? Now type RUN and push RETURN. The program should now light 3 blocks.

Things to Remember

You can add lines to a program. Use a new line number.

LIST is a good "fix check."

You've already learned these important BASIC words.

IMPORTANT BASIC WORDS

Special Key	What it does when you push it
RETURN	sends what you've typed to the computer (CPU).
←	lets you correct typing mistakes. (only works **before** you push RETURN .)

Commands	Type without a line number to...
HOME	erases the screen—does **NOT** erase a program.
NEW	erases the program in RAM.
LIST	lets you look at a program (gets it from RAM)
RUN	starts a program running
TEXT	lets you use the whole TV screen for words

Statements	Use with a line number in a program to...
1Ø GR	tells the computer to use the TV for graphics
15 COLOR=	selects a color from Ø to 15 (colors are on the next page)
2Ø PLOT __,__	lights 1 block on the T.V.

Put a copy of this page by the computer

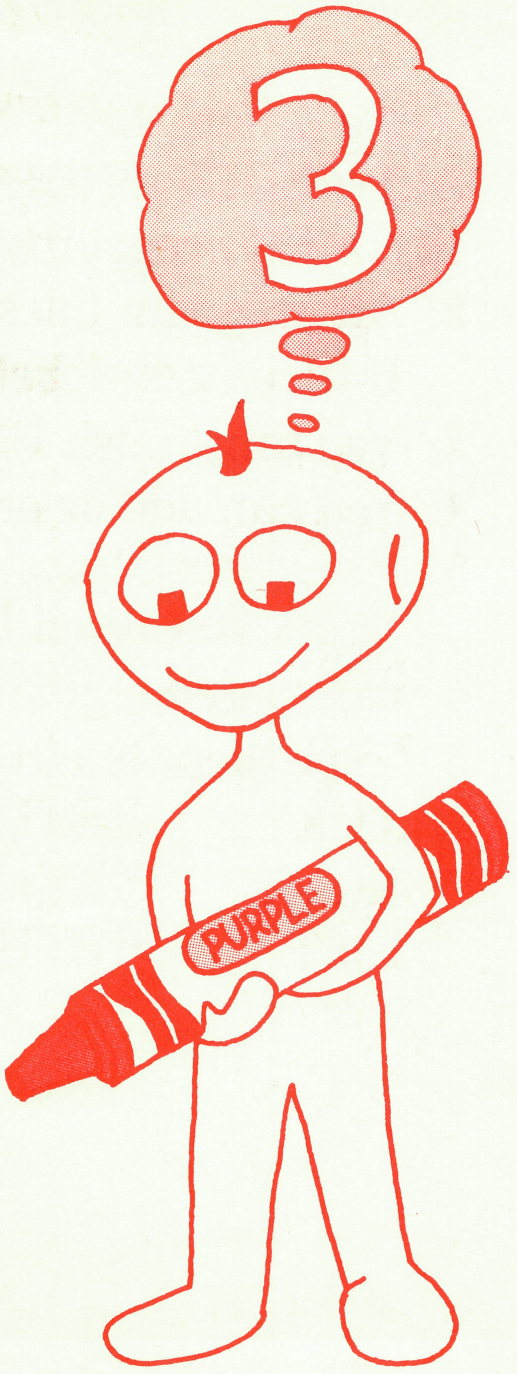
APPLE II
COLOR NUMBERS

1Ø COLOR=____

Put one of these numbers here ↑ to use this color ↓

Ø	Black
1	Magenta (Red)
2	Dark Blue
3	Purple
4	Dark Green
5	Light Grey
6	Medium Blue
7	Light Blue
8	Brown
9	Orange
1Ø	Dark Grey
11	Pink
12	Light Green
13	Yellow
14	Aqua
15	White

Put a copy of this page by the computer



Remember these things about programs.

ALL ABOUT PROGRAMS

1. BASIC programs have line numbers.
2. All program lines must be typed correctly. If there's one error a program won't work.
3. You must push RETURN after each line.
4. You can add or erase program lines.
5. Programs almost never work right the first time. You often have to fix them. This is called **debugging.**
6. Type these lines to LIST a graphics program.

```
TEXT      RETURN
HOME      RETURN
LIST      RETURN
```

Name _____

PLOT __, __ PRACTICE

Here are some graphics programs. Each program uses PLOT__,__ to light some blocks. Type in a line. Check the typing on each line. Use the ← key to fix mistakes. Then push RETURN. Put a check in the box when done.

Type all the lines.

- ☐ TEXT
- ☐ HOME
- ☐ NEW
- ☐ Ø5 GR
- ☐ 1Ø COLOR=7
- ☐ 15 PLOT 19, 36
- ☐ 2Ø PLOT 2Ø, 35
- ☐ 25 PLOT 2Ø, 34
- ☐ 3Ø PLOT 21, 36
- ☐ RUN

Draw the figure over here. ➘

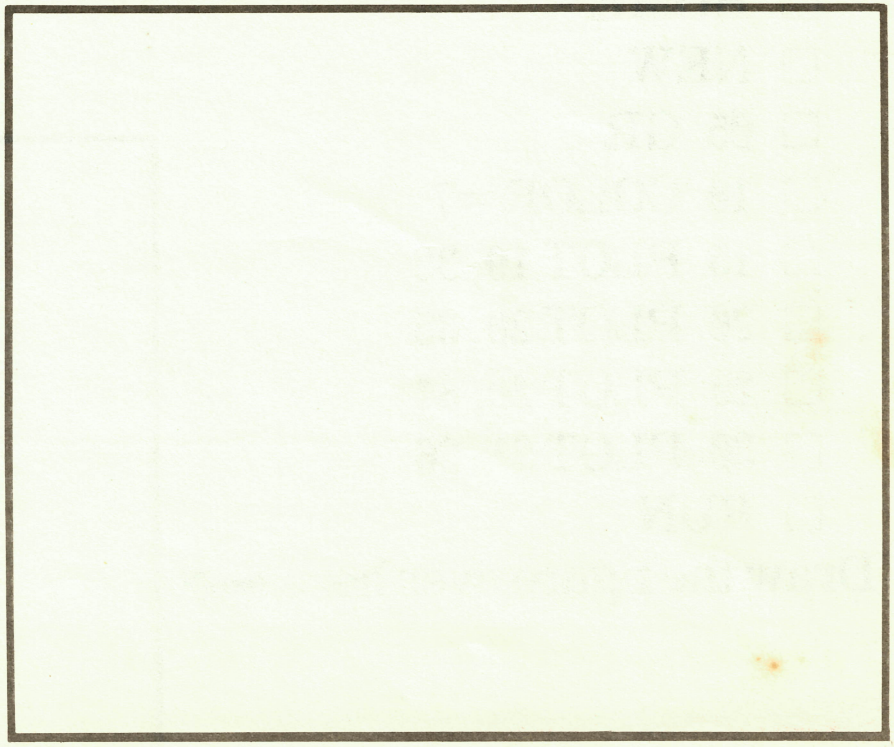
Is your last program still in the computer?
Type these lines to see.

TEXT RETURN
HOME RETURN
LIST RETURN

Is your program in the computer? If it is, do **not** type the first two lines.

```
NEW
1Ø GR
35 COLOR=13
4Ø PLOT 20, Ø
45 PLOT 2Ø, 2
5Ø PLOT 2Ø, 4
55 PLOT 18, 2
6Ø PLOT 22, 2
RUN
```

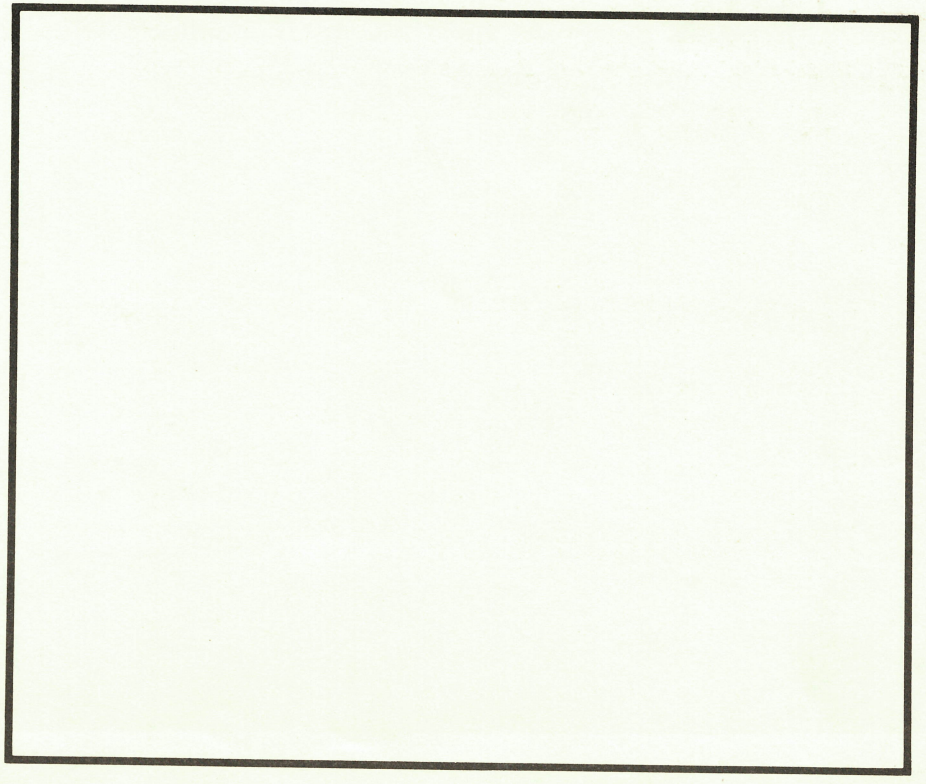
Draw the figure over here. →



One more program.

```
TEXT
HOME
NEW
Ø5 GR
1Ø COLOR=6
15 PLOT 19, 18
2Ø PLOT 21, 18
25 COLOR=9
3Ø PLOT 18, 2Ø
35 PLOT 19, 21
4Ø PLOT 2Ø, 21
45 PLOT 21, 21
5Ø PLOT 22, 2Ø
RUN
```

Draw the figure over here. ➥



NOTES

Block Addresses

chapter 5

Look at the picture on the next page. There are a lot of small blocks. Count the number of small blocks across the screen. Do this now before you read on. You should get 40. Now, look at the top of the picture. Find the small numbers. These numbers go from 0 to 39. If you start counting with 0 you will get 39, too. Now, count the blocks from top to bottom. Do this before you read on. You will get 39 if you start with 0. Try it. These numbers are on the left of the picture. Find these little numbers now.

Things to Remember

There are 40 blocks across →

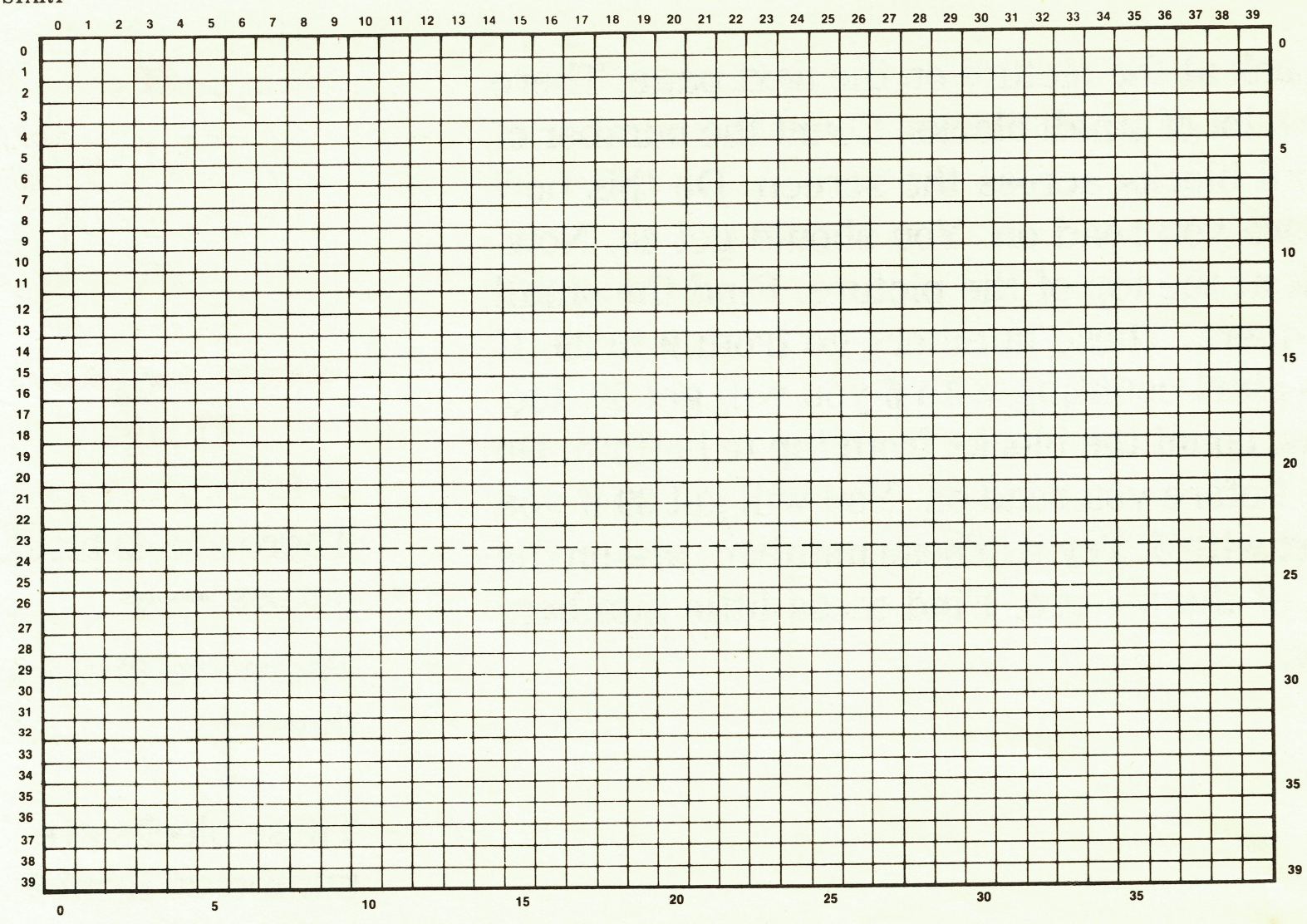
There are 40 blocks down ↓

These blocks are numbered from 0 to 39.

BLOCK ADDRESSES

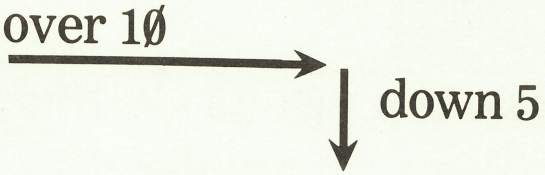
FIRST COUNT OVER → THEN COUNT DOWN ↓

START



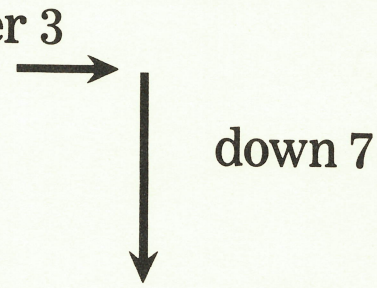
Each little block has an address. It is a two number address. The first number is how far over it is. The second number is how far down it is. These are the 2 numbers after PLOT.

Example 1: Block 1Ø, 5 is **over** 1Ø and **down** 5



Find block 1Ø, 5 on the chart now.

Example 2: Block 3, 7 is **over** 3 and **down** 7.



Find block 3, 7 on the chart now.

Things to Remember

A block address is over → then down ↓

Block Colors

COLOR=_ tells the computer what color you want. A color number goes in the blank. Any number Ø to 15 will work. See the chart on page 21. You can change color anytime you want. Here are some examples.

Example 1: (Don't type this. It's just an example.)

```
Ø5 COLOR=1
1Ø PLOT 2Ø, 2Ø
```

Lights a block. Its address is over 2Ø, down 2Ø. It will be **color 1, red.**

Example 2: (Don't type this.)

```
Ø5 COLOR=9
1Ø PLOT 5, 2Ø
15 PLOT 5, 3Ø
```

Lights two blocks. One is over 5, down 2Ø. The other is over 5, down 3Ø. **Both** will be color 9, orange.

Things to Remember

COLOR=_ is used to pick a color. Color numbers Ø-15 can go in the blank.

Example 3 (Don't type this.)

```
Ø5 COLOR=1
1Ø PLOT 1Ø, 3
15 COLOR=13
2Ø PLOT 3, 35
```

Lights two blocks. One will be color 1, red. It will be over 1Ø, down 3. The other block will be color 13, yellow. It will be over 3, down 35.

Think of the PLOT statement like this

PLOT Number of blocks over → , Number of blocks down ↓

Things to Remember

PLOT_,_ lights a block.

HINT

To look at a graphics program you type this:

TEXT RETURN
HOME RETURN
LIST RETURN

There is an easier way!

TEXT:HOME:LIST RETURN

all on one line. Don't forget the : between each word.

BLOCK ADDRESSES

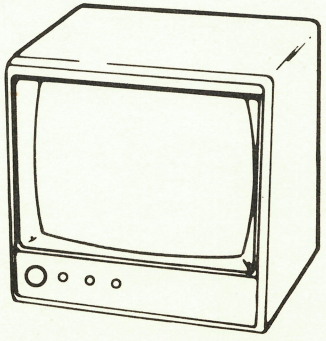
Lesson Two
Name _____

This lesson will help you answer four questions about block addresses.

Program 1: What happens when both numbers are small?

```
TEXT:HOME:NEW
Ø5 GR
1Ø COLOR=1
15 PLOT Ø, Ø
2Ø PLOT 2, 2
RUN
```

Where are the blocks when both numbers are small? Put an X on the picture.



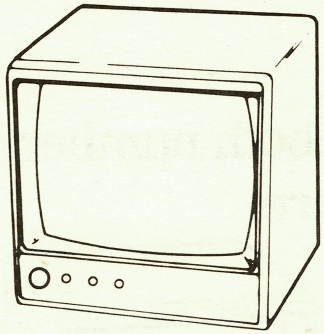
What color were the blocks? Answer _____.

Program 2: What happens when both numbers are large?

Type this program.

```
TEXT:HOME:NEW
Ø5 GR
1Ø COLOR=3
15 PLOT 39, 39
2Ø PLOT 37, 37
RUN
```

Where are the blocks when both numbers are large? Put an X on the picture.



What color were the blocks? Answer _____.

Program 3: What happens when the first number gets larger?

Type this program.

```
TEXT:HOME:NEW
Ø5 GR
1Ø COLOR=12
15 PLOT 13, Ø
2Ø PLOT 26, Ø
25 PLOT 39, Ø
RUN
```

Which way does the first number move the blocks? (Hint: across or down?)

Answer _____

What color were these blocks? Answer _____

Program 4: What happens when the second number gets larger?

Type this program.

```
TEXT:HOME:NEW
Ø GR
1Ø COLOR=11
15 PLOT Ø, 13
2Ø PLOT Ø, 26
25 PLOT Ø, 39
RUN
```


Which way does the second number move the blocks? (Hint: down or across?)

Answer _____

What color are these blocks? Answer _____

chapter 6

Designs

You can write your own graphics program. This chapter will teach you how. Look at the designs on the next page. Do this now.

Just read this now. You will do it later. To make a graphics program you:

1. Shade in blocks to make a design. Use colored pencils or sharp crayons. Try to use only a few blocks. This has been done on the next page.
2. Find all the blocks of the same color. Find the address of each block. First count over, then count down. Write the address under the right color. Do it like this.

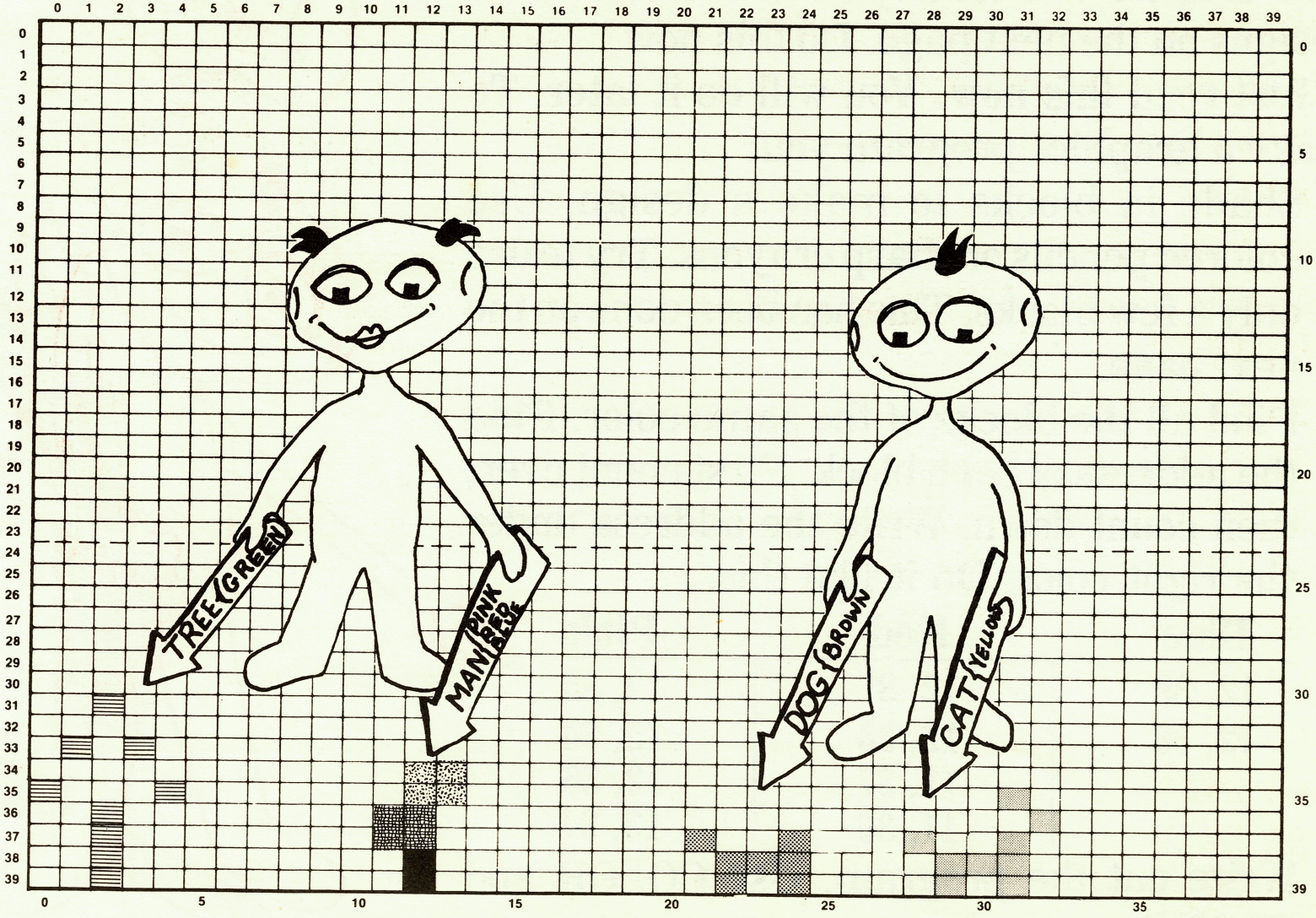
Blue	Red	Pink
12, 39	12, 37	12, 35
12, 38	12, 36	12, 34
	11, 37	13, 35
	11, 36	13, 34

3. Write out the program. Use COLOR and PLOT lines.
4. Type in the program.

BLOCK ADDRESSES

FIRST COUNT OVER → THEN COUNT DOWN ↓

START



DESIGNS

Lesson Three

Name _____

Let's do one of the designs on the last page. Try the man first. Write the address numbers in the blank spaces. Also write in the color numbers. Then type in the program.

```
TEXT:HOME:NEW
Ø5 GR
1Ø COLOR= __
15 PLOT __, __
2Ø PLOT __, __
25 COLOR=__
3Ø PLOT __, __
35 PLOT __, __
4Ø PLOT __, __
45 PLOT __, __
5Ø COLOR= __
55 PLOT __, __
6Ø PLOT __, __
65 PLOT __, __
7Ø PLOT __, __
RUN
```

blue jeans

red shirt

pink head

Now, do one of the other figures. Write the form below on your paper. Then fill in the lines.

Is your last program still in the computer? If it is you can add to it. You won't need these two lines.

```
TEXT: HOME
NEW
10 GR
75 COLOR= __
80 PLOT __, __
85 PLOT __, __
90 PLOT __, __
95 PLOT __, __
100 PLOT __, __
105 PLOT __, __
110 PLOT __, __
```

You can add a COLOR= __ line any place you want.

Add more PLOT lines if you need them. Cross out any lines you don't need.

YOUR OWN DESIGN

Name _____

Look at the next page. Use colored pencils to shade in a design. Don't use very many blocks. Find the address of each block. Make a list of these addresses under their color. Then do this lesson. It will help you with your program.

Don't type this program yet.

```
TEXT:HOME:NEW
Ø1 GR
Ø5 COLOR= __
1Ø PLOT __, __
15 PLOT __, __
2Ø PLOT __, __
25 PLOT __, __
3Ø PLOT __, __
35 PLOT __, __
4Ø PLOT __, __
```

① Write the block addresses here.

② Add COLOR= __ lines where you want to change color.

③ Add more PLOT lines if you need them. Cross out any lines you don't need.

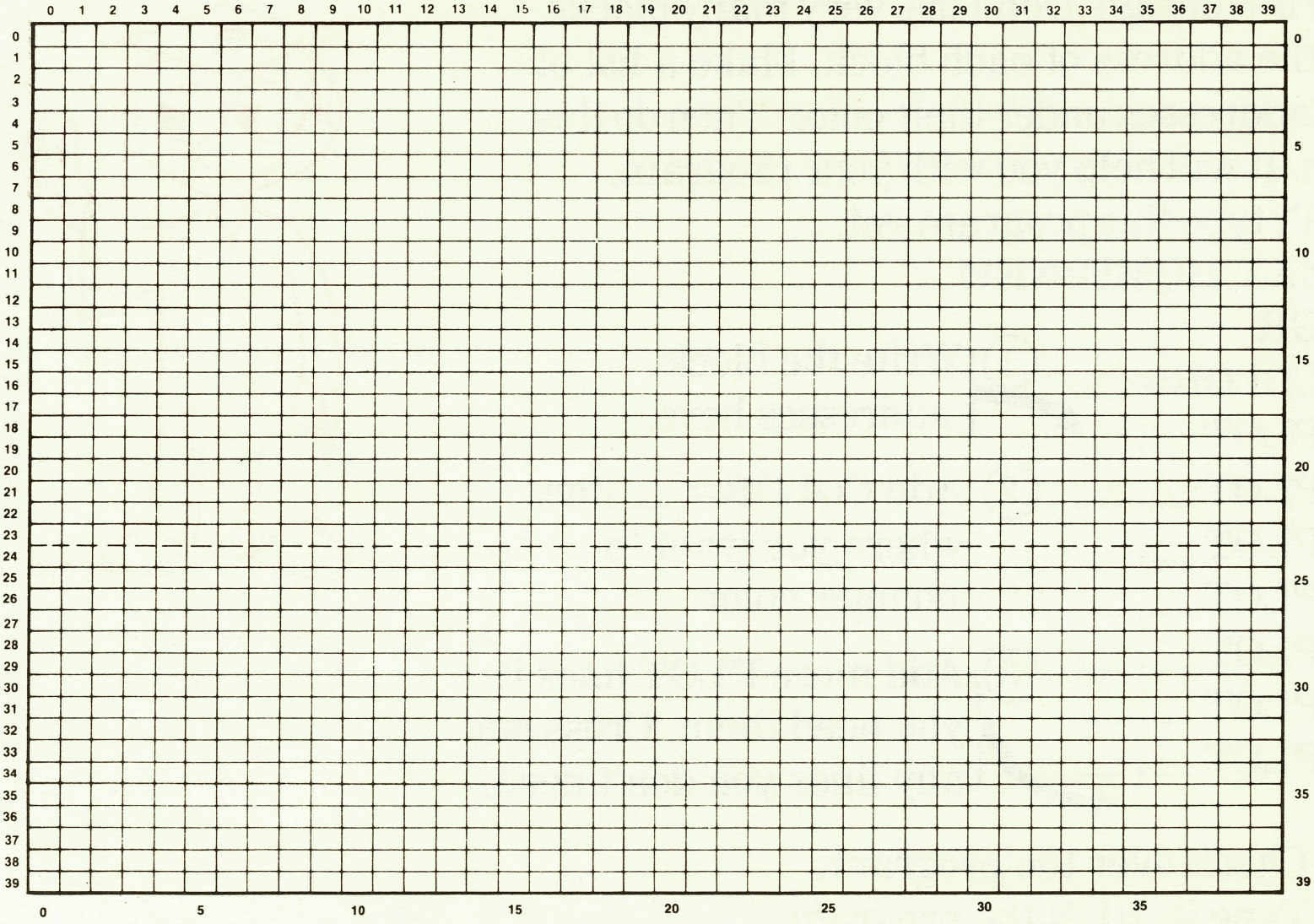
④ Check over the program.
Type it. RUN the program.

⑤ Debug the program if you need to.

BLOCK ADDRESSES

FIRST COUNT OVER → THEN COUNT DOWN ↓

START



Variables

The same thing can be written many different ways. Here are four ways to write one math problem.

$$_ + _ = 4$$
$$\square + \square = 4$$
$$\bigcirc + \bigcirc = 4$$

These are all the same easy problem. You just find 2 numbers that add up to 4.

The space, line, square, and circle all mean the same thing. They mean, "put a number here."

Most computer languages don't use these blanks, circles, or squares. They use letters. In computer language the problem is written

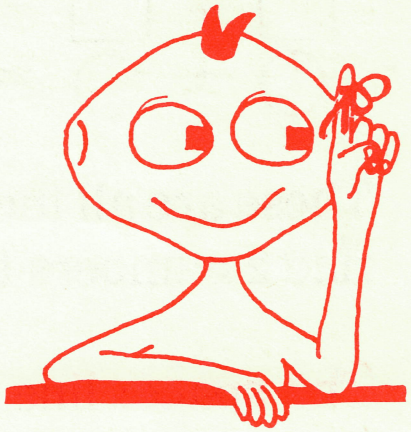
$$X + Y = 4$$

The X and Y mean the same thing as blanks. They mean X and Y will become numbers. PLOT __, __ is usually written PLOT X, Y. They both mean the same. X and Y are called variables. They are called this because they change. They are different numbers in different programs.

Experiment: Take time now to write a few of your own programs. Try to program a graphic that is

1. an alphabet letter
2. a small make-believe monster
3. a pine tree

Look in the back of this book for some ideas.



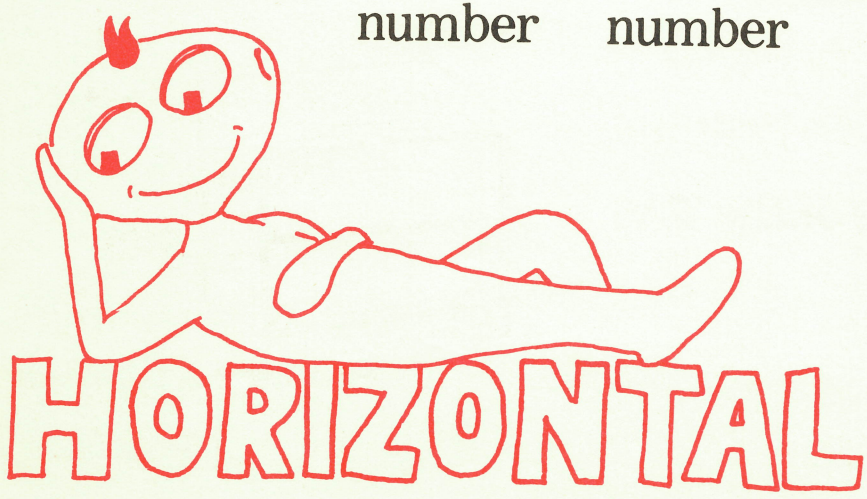
Things to Remember

PLOT X, Y means the same as PLOT __, __

Left-Right Lines

It takes a lot of PLOT's to draw a line. To draw one across the TV takes 40 PLOT's. You'd have to light blocks 0 to 39. Luckily there's an easier way. You can use the word HLIN. HLIN draws lines from left to right. The H stands for horizontal. It works like this.

HLIN left start number , right stop number AT number of lines down



Things to Remember

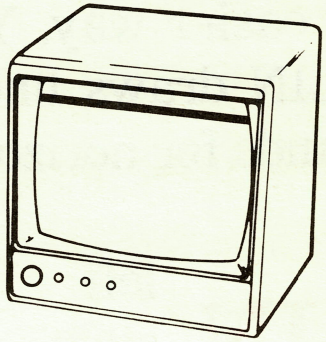
HLIN __, __ AT __ draws a left-right line.

Here are some examples. **Don't type these yet** — just study them.

Example 1

```
1Ø HLIN Ø, 39 AT Ø
```

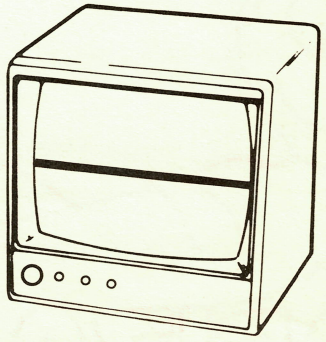
This draws a line across the **top** of the T.V. It's down Ø from the top.



Example 2

```
1Ø HLIN Ø, 39 AT 2Ø
```

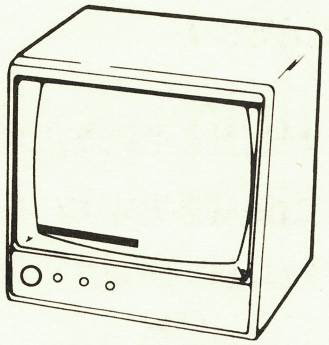
This draws a line across the middle of the T.V. It's down 2Ø from the top.



Example 3

```
1Ø HLIN Ø, 19 AT 39
```

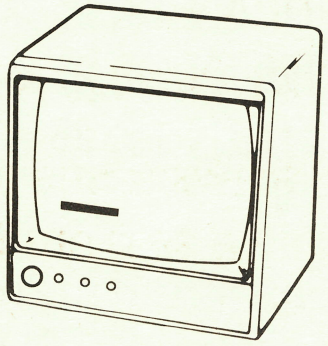
This draws a line half way across the T.V. It will be AT 39, the bottom of the T.V.



Example 4

```
1Ø HLIN 2Ø, 25 AT 3Ø
```

This draws a shorter line. It will be 3Ø blocks down.



HLIN makes it a lot easier to do graphics. Here's an example. Type and RUN this program. Don't forget **RETURN** after each line.

```
TEXT:HOME:NEW
Ø5 GR
1Ø COLOR=2
15 HLIN 15, 17 AT 1Ø
2Ø HLIN 15, 17 AT 11
25 HLIN 15, 17 AT 12
3Ø COLOR=1
35 HLIN 18, 25 AT 1Ø
4Ø HLIN 18, 25 AT 12
45 HLIN 15, 25 AT 14
5Ø HLIN 15, 25 AT 16
RUN
```

You can stand and salute if you'd like. Oops — we forgot the flag pole.

Don't erase the program yet.

Up-Down Lines

VLIN is used to draw up and down lines. V stands for vertical. Think of VLIN as

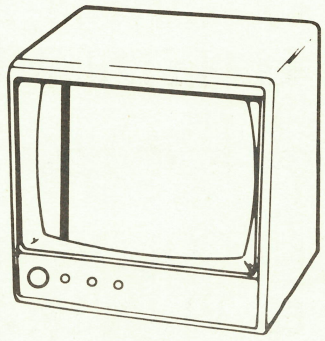
VLIN top start number , bottom stop number **AT** number of lines over

Here are two examples. **Don't type these.**

Example 1

```
10 VLIN 0, 39 AT 0
```

This draws an up-down line on the left. It looks like this.



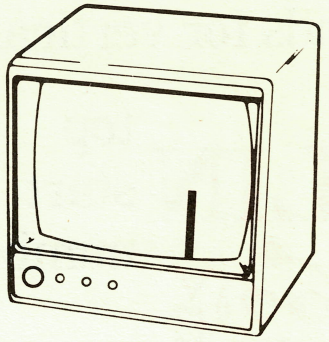
Things to Remember

VLIN __, __ AT __ draws an up-down line.

Example 2

```
1Ø VLIN 2Ø, 39 AT 3Ø
```

This draws a shorter line. It will be over 3Ø from the left.



Now let's add the flag pole. Type this line to list your program.

```
TEXT:HOME:LIST
```

Now add these lines to your program.

```
55 COLOR=8
6Ø VLIN 1Ø, 28 AT 13
```

Now RUN the program.

Name _____

HLIN and VLIN

Type and RUN this program. It uses lines to make a graphic.

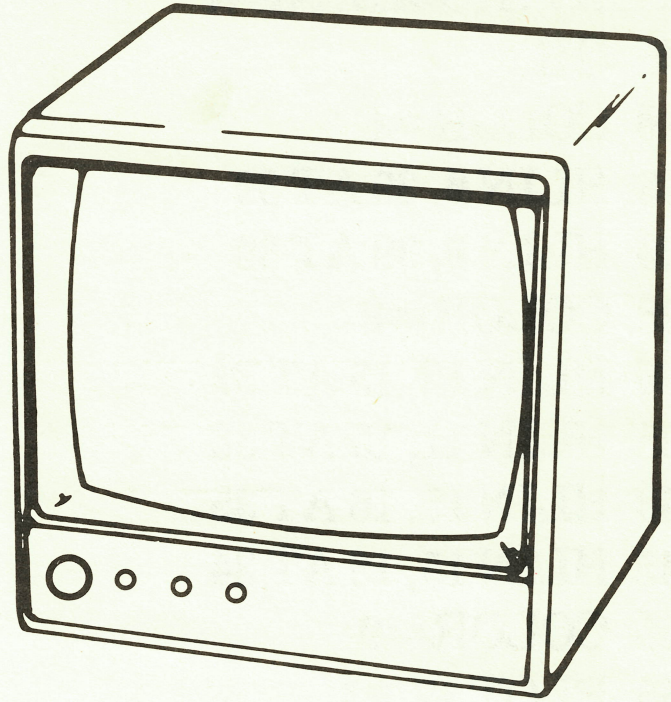
```
TEXT:HOME:NEW
Ø5 GR
1Ø COLOR=6
15 HLIN Ø, 39 AT 39
2Ø HLIN Ø, 39 AT 38
25 COLOR=8
3Ø HLIN 12, 15 AT 37
35 HLIN 11, 15 AT 36
4Ø HLIN 15, 16 AT 35
45 HLIN 15, 16 AT 34
5Ø COLOR=9
55 PLOT 17, 35
```

Draw the figure below. Can you tell what it's supposed to be? (Hint: quack-quack)

One more program.

```
TEXT:HOME:NEW
Ø5 GR
1Ø COLOR=4
15 HLIN Ø, 39 AT Ø
2Ø VLIN Ø, 39 AT 39
25 HLIN Ø, 39 AT 39
3Ø VLIN Ø, 39 AT Ø
```


Draw what happened over here. →



It's your turn. Draw a graphic on the next page. Don't use too many lines or blocks. Then program your design below. Put all the lines of the same color together. This will save typing.

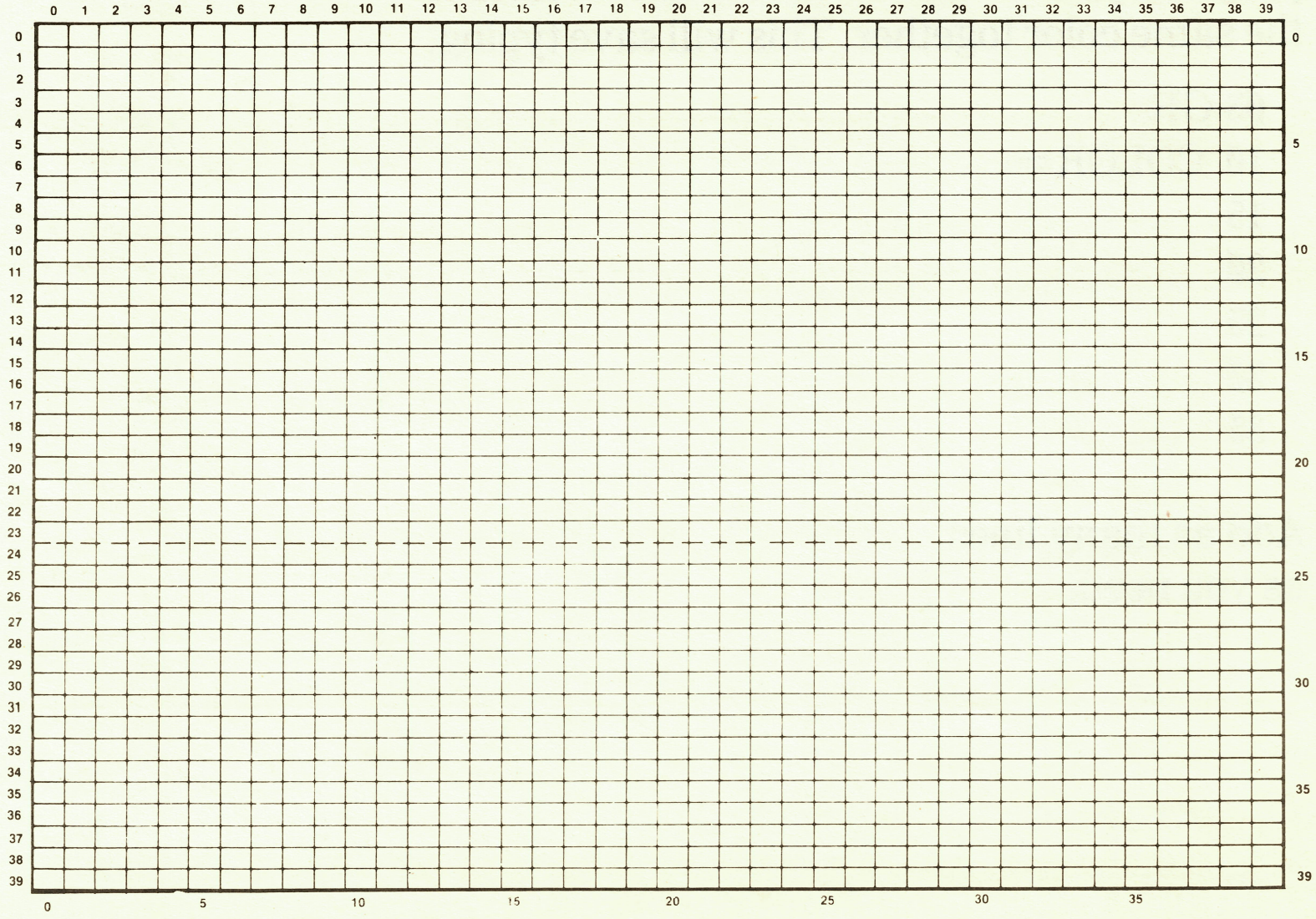
```
Ø5 GR
1Ø COLOR=
15
2Ø
25
3Ø
35
```

Add as many lines
as you need.

BLOCK ADDRESSES

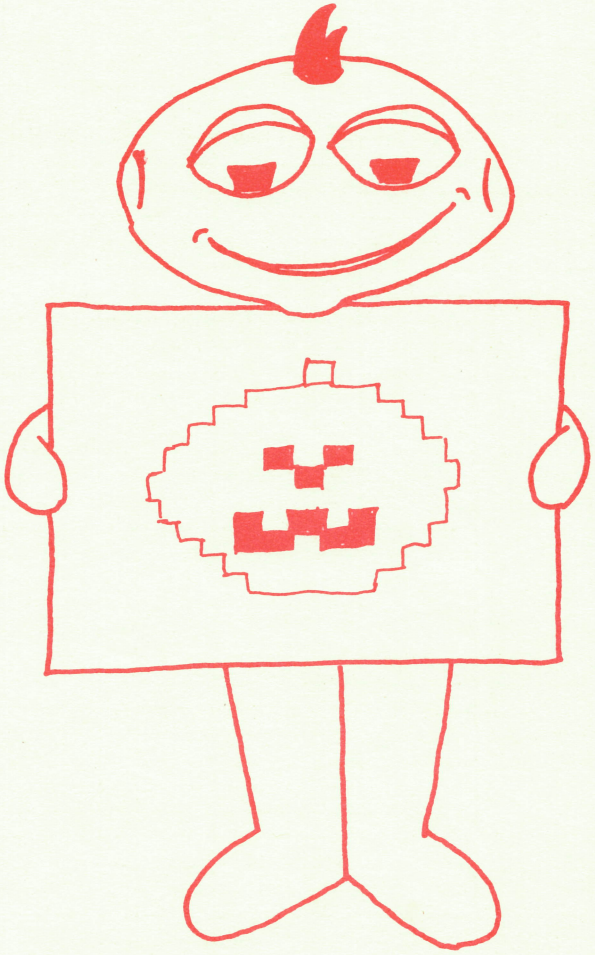
FIRST COUNT OVER → THEN COUNT DOWN ↓

START



Experiment: Doing what is in this book isn't programming. It's reading and studying. **Take time now to write a few programs** Here are some ideas.

1. Look at the graphic pictures in the back of this book.
2. Design your own picture.
3. Try to do one for a holiday like:
   - Christmas
   - Columbus Day
   - Easter
   - Fourth of July
   - Halloween
   - Thanksgiving
4. Program the picture.



NOTES:

Easy Basic Words

Output

Enough graphics for now. We'll do more graphics later. PLOT, VLIN, and HLIN are "output" commands. They put things on the T.V. PRINT is another "output" command. It is used to "output" words and numbers.

PRINT" "

See the " " marks? These are very important. They tell the computer, "don't mess with this stuff. Just put it on the screen." You can put anything you want inside these marks. Here is an example. Type and RUN this program.

```
TEXT:HOME:NEW
Ø5 HOME
1Ø PRINT "**********"
15 PRINT "put your name here"
2Ø PRINT "**********"
RUN
```

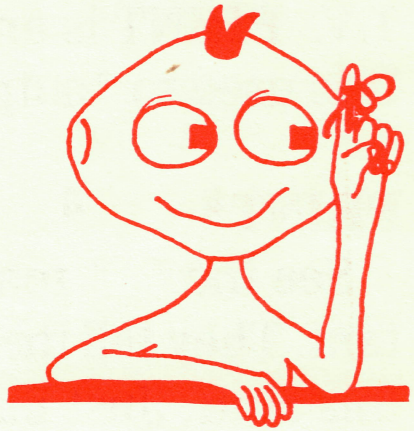
Things to Remember

PRINT " " puts what's between the marks on the screen.

HOME can also be used in a program line.

Let's try one more PRINT " " program. This time, you decide what goes inside the " " marks.

```
NEW:HOME
Ø5 HOME
1Ø PRINT "      put anything      "
15 PRINT "        you want        "
2Ø PRINT "          here          "
25 PRINT "                        "
RUN
```

Things to Remember

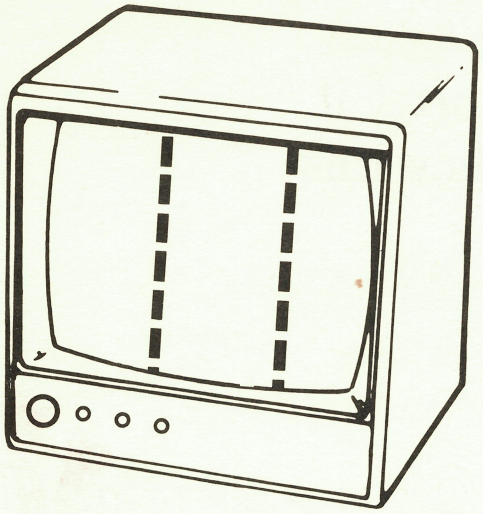
; keeps the output close together

, puts the output into columns

Punctuation

You can put several things on one PRINT line. But, what goes between them is important. A comma (,) or a semi-colon (;) may be used. A ; makes the output close together. A , makes the output in "columns." There are 3 "columns" across the T.V.

They look like this.



Type and RUN this program. See the ; and , ?
They make a difference.

```
HOME:NEW
Ø5 HOME
1Ø PRINT "ONE"; "TWO"; "THREE"
15 PRINT "ONE", "TWO", "THREE"
RUN
```

Don't forget. A ; keeps things together. A ,
puts them into columns.

Skipping Lines

You can skip lines when you print. It's easy, just type PRINT. Don't put anything after it. Type and RUN this program. It shows how this works.

```
HOME:NEW
10 PRINT "HELLO", "THERE"
15 PRINT
20 PRINT "HOW ARE YOU?"
25 PRINT
30 PRINT
35 PRINT "I AM FINE"
RUN
```

Don't erase the program yet. Read on.

Things to Remember

PRINT followed by nothing outputs a blank line.

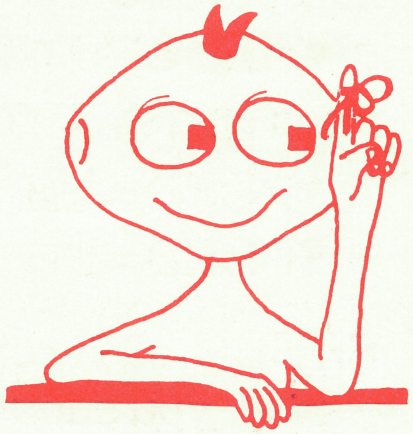
Slowing Down Programs

Computers are very fast. So fast it's hard to see what they do. Some programs are neater if they run slower. To slow down the APPLE type

SPEED=1ØØ

without a line number.

Do this now. The number after speed can be from Ø to 255. Now RUN your last program again.



Things to Remember

SPEED= ____ slows down or speeds up the computer.
Use a number from Ø to 255.
Ø is slow,
255 is fast.

Try these other SPEED numbers. Then RUN your program again.

```
SPEED=Ø
SPEED=15Ø
SPEED=255
```

SPEED=255 returns the APPLE to normal.

Now you should begin to use this command. Just type it whenever you want. It can help you see how a program works. But, it won't work with graphic programs.

Experiment

Write a program that PRINTS a message. Type SPEED=____ to slow down the program.

Drawing Pictures With PRINT

You can even draw pictures with PRINT lines! Here is an example. Type and RUN this program.

```
HOME:NEW
Ø5 HOME
1Ø PRINT "   !!!!!!   "
15 PRINT "!!!!!!!!!!"
2Ø PRINT "    *   *    "
25 PRINT "      L      "
3Ø PRINT "    XXX    "
RUN
```

Here is another example. Type and RUN this program.

```
HOME:NEW
Ø5 HOME
1Ø PRINT "BOOM"
15 PRINT "B-O-O-M"
2Ø PRINT "B--O--O--M"
25 PRINT "B---O---O---M"
3Ø PRINT "B----O----O----M"
35 PRINT "B-----O-----O-----M"
RUN
```

Type SPEED=1ØØ. Then RUN the program again.

Fancy PRINT

Lesson Six

Name _____

Design your own PRINT program. Try to make a fancy sign. Or try to draw a picture. Use SPEED= __ to add interest. Use a lot of special keys like: * ! ‹ › & ? . You could even write a poem or story. Do what ever you want. If your computer has a printer, ask someone how to use it now.

```
NEW
Ø5 HOME
1Ø PRINT "          Put          "
15 PRINT "       anything        "
2Ø PRINT "      you want         "
25 PRINT "        here.          "
```

← Add more lines here if you need to.

```
RUN
```

Write what's on the T.V. over here. →

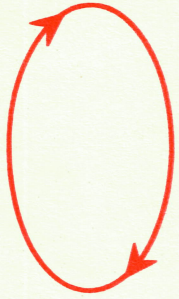
GOTO

GOTO tells the computer which line to do next. It tells it where to go in a program. Here is an example:

```
99 GOTO 5
```

It works like this. The computer does the lines from 5 to 98. Then it comes to 99. It sees the instruction GOTO 5. So it goes back to line 5. This makes the computer start all over again. It does this forever or until you push **RESET**. Computer people say, "It's stuck in a loop."

Try it! Type and RUN this program.



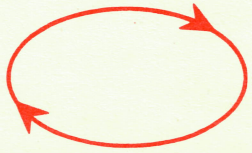
```
NEW:HOME
Ø5 PRINT " Your first name "
1Ø PRINT " Your last name "
99 GOTO 5
RUN
```

The program goes around this circle forever. Push **RESET** to stop the program.

Things to Remember

GOTO tells the computer which line to do next.

Press **RESET** or **CTRL** **RESET** if a program is "stuck in a loop."



On some APPLES you'll have to:

1. Hold down the **CTRL** key
2. And press the **RESET** key.

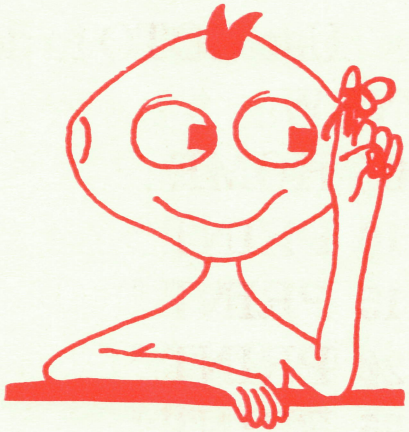
Here is another example of GOTO.

```
HOME:NEW
Ø5 HOME
1Ø PRINT " ***** "
15 PRINT "++++++++++++++"
2Ø PRINT "!!!!!!!!!!!!!!"
99 GOTO 1Ø
```

Push RESET to stop the program. Don't erase it yet. Change Line 99 to

```
99 GOTO 2Ø
```

RUN the program. See the difference? Push RESET to stop the program. Try different SPEED= __ numbers to see how it works.



Things to Remember

You can GOTO any line. But there must be a line there.

PRINT a Picture and GOTO

Lesson Seven
Name _____

You can use PRINT " " lines to make a picture. Let's try it.

1. **Finish the program below.** Make a picture that looks like a rocket. Do this inside lines 1Ø to 25.
2. Make the rocket fly off the screen. To do this PRINT a lot of " ! ! ! " marks under it. Use GOTO to do this.

```
NEW
Ø5 HOME
1Ø PRINT "                    "
15 PRINT "                    "
2Ø PRINT "                    "
25 PRINT "                    "
3Ø PRINT "          !         "
35 PRINT "         !!!        "
4Ø PRINT "        !!!!!       "
5Ø GOTO ____
```

Explain what happened below.

Memory Boxes and Numbers

The computer has a memory. It is called RAM. RAM is like a lot of little boxes. To use memory you

1. Give a box a name
2. Tell what goes in the box

Here are some examples.

Ø5 A=1Ø
1Ø B=5
2Ø M=2Ø

This looks like this inside a computer.

Memory Boxes

A	B	M
1Ø	5	2Ø

PRINT

PRINT is used to get numbers from memory. You just don't use the " " marks. PRINT A gets the number in box A. It puts it on the TV screen. PRINT A, B, M gets a number from each box. It prints them all on the T.V.

Things to Remember

A memory box must be given a name. This is usually one letter.

Numbers can be stored in memory boxes.

PRINT A outputs the number in Box A to the T.V.

MATH

You can do math when you PRINT. PRINT A+B will get both numbers. It adds them and puts the answer on the T.V.

The computer uses 2 special symbols to do math. Study the table below. Find the * and the / .

Math

Problem	Example	Symbol	Type
Add	A+B	+	PRINT A+B
Subtract	A-B	-	PRINT A-B
Multiply	AxB	*	PRINT A*B
Divide	A÷B	/	PRINT A/B

Things to Remember

You can do math with PRINT lines.

* is used to multiply.

/ is used to divide.

Memory, PRINT, and Math

Lesson Eight

Name _____

These programs put numbers into memory boxes. They PRINT numbers from the boxes. They also do math with the numbers.

```
HOME:NEW
Ø5 HOME
1Ø A = 2
15 B = 78
2Ø C = 1Ø4
25 PRINT "THE NUMBERS ARE..."
3Ø PRINT A, B, C
35 PRINT "A + B + C = "
4Ø PRINT A + B + C
```

Puts numbers into memory boxes.

PRINTS them out.

Adds them and PRINTS the answer.

Answer A + B + C =

The computer can do very hard problems. Here is an example:

```
HOME:NEW
Ø5 HOME
1Ø A=8
15 B=832
2Ø PRINT "8 PLUS 832 IS"
25 PRINT A+B
3Ø PRINT "832 TIMES 832 IS"
35 PRINT B*B
4Ø PRINT "832 DIVIDED BY 8 IS"
45 PRINT B/A
RUN
```


Write the answers below.

8 PLUS 832 IS _____

832 TIMES 832 IS _____

832 DIVIDED BY 8 IS _____

YOUR TURN! Write your own program.

```
NEW
Ø5 HOME
1Ø
15
2Ø
25 PRINT
3Ø PRINT
35 PRINT
4Ø PRINT
45 PRINT
5Ø RUN
```

Put some numbers into memory boxes.

PRINT them out.

Do some math if you'd like.

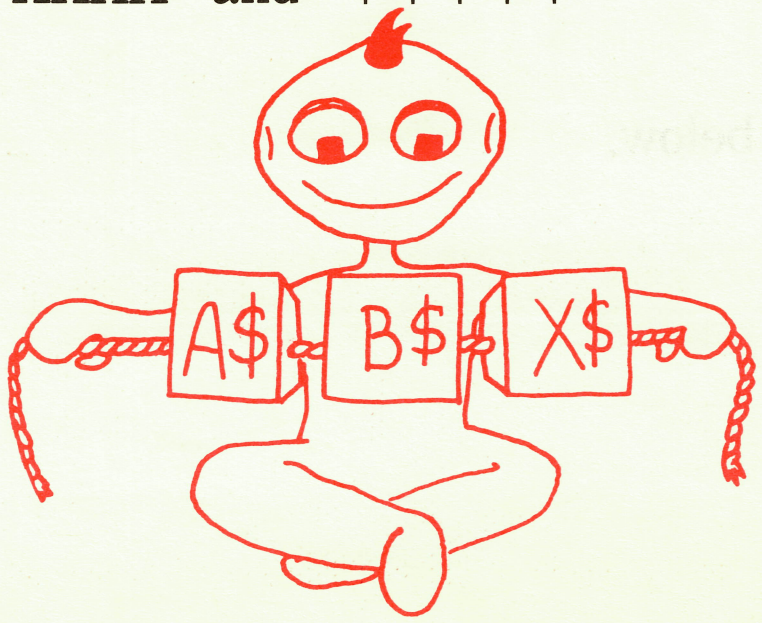
Write your problems and answers below.

Problems	Answers
_____	_____
_____	_____
_____	_____

Strings

Now for some super neat stuff. You can put words or symbols into memory boxes. In computer language, words are called **strings**. You have to remember two things.

- Memory boxes for strings must have a $ after them. Examples are A$, B$, X$, and so on.
- The words must be in " " marks. Examples are "BOB" "FRED" "XXXX" and "++++++"



Things to Remember

Words inside a computer are called **strings.**

String memory boxes must have a $ in their name. Strings must be in quotes " ".

Example 1 (Don't type this yet)

```
1Ø A$="*****"
```

This puts five *'s into a memory box.

Example 2 (Don't type this yet)

```
15 B$="+++++"
```

This puts five plus signs into a box.

Example 3 (Don't type this yet)

```
2Ø PRINT A$
```

This prints ***** on the screen.

Example 4 (Don't type this yet)

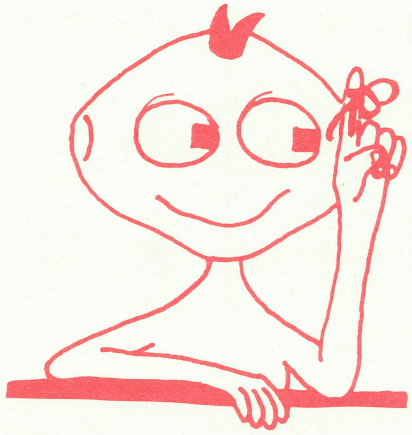
```
25 PRINT A$+B$+A$
```

This prints

*****+++++*****

on the screen.

Surprise! You can add strings.



Things to Remember

You can add strings together.

Strings, PRINT and GOTO

Lesson Nine
Name _____

You're going to like these programs!

```
HOME:NEW
Ø5 HOME
1Ø A$="* * * * * * * * * * * * * * * * * * * * *"
15 B$="t y p e  y o u r  n a m e  h e r e"
2Ø C$="+++++++++++++++++++++++"
25 PRINT A$
3Ø PRINT B$
35 PRINT C$
4Ø PRINT A$+C$+A$
RUN
```

Don't erase the program yet!

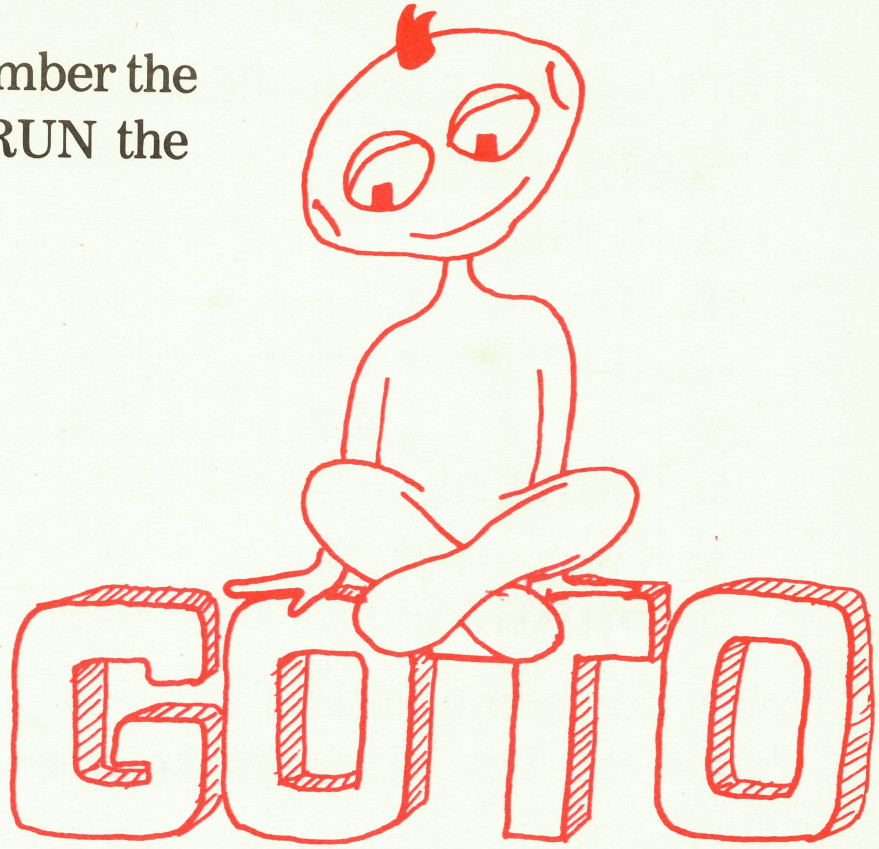
Draw what's on the screen below.

Now, change the last program. Remember the GOTO? Type the line below. Then RUN the program.

```
5Ø GOTO 25
```

Push **RESET** to stop the program.

Draw what's on the screen below.



Here's another program.

```
HOME:NEW
Ø5 HOME
1Ø A$="* * * * * * * * * * "
15 B$="++++++++++++"
2Ø C$="Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø "
25 PRINT A$
3Ø PRINT A$+B$
35 PRINT A$+B$+C$
```


Now add some PRINT lines to the program. Make the line numbers between 35 and 99. Then, try

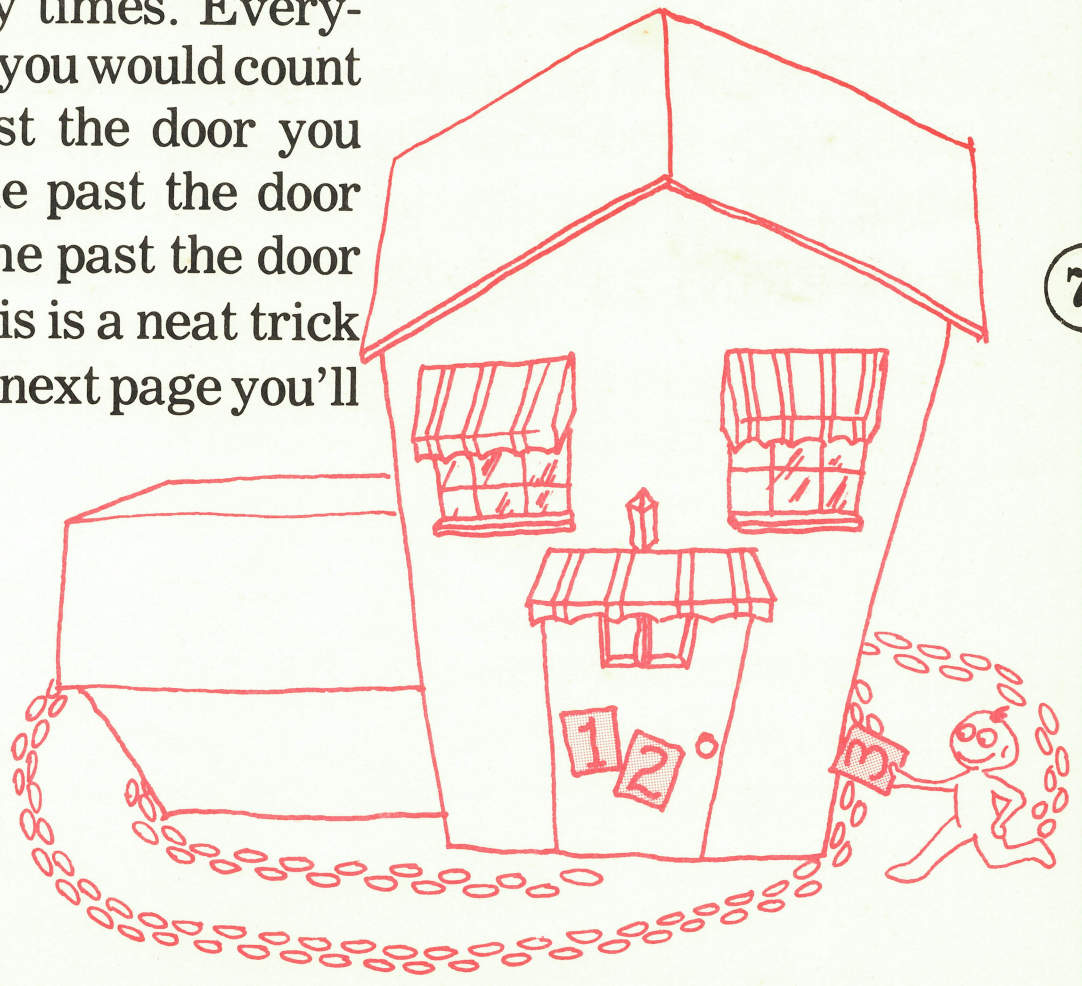
```
99 GOTO ____
```

Experiment! Then write your neatest program below.

chapter 9

Do Loops

A do loop tells the computer to do one thing many times. It's like getting a computer to go around in a circle. Every time it goes around once it does something. This is like you running around your house many times. Everytime you passed the front door you would count a number. The first time past the door you would say 1. The second time past the door you would say 2. The third time past the door you would say 3. And so on. This is a neat trick to get a computer to do. On the next page you'll see how to do it.

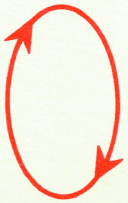


FOR, TO, and NEXT are BASIC words. They are used to make a do loop. FOR and TO must be on the same line. They start the computer counting. You must tell the computer what number to start with. You also must tell the computer how far to count. FOR X=1 TO 1Ø makes the computer count from 1 to 1Ø. FOR C=5 TO 25 makes the computer count from 5 to 25. NEXT is used to tell it when to add one. Here is a program with a do loop. Study it carefully.

Things to Remember

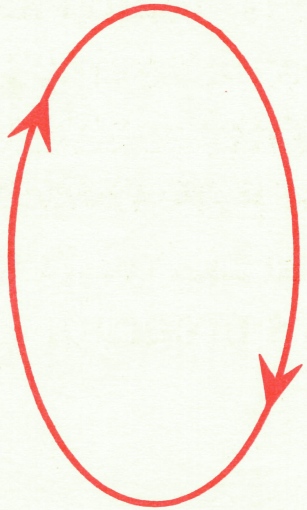
Do Loops look like this.

FOR X= __ TO __



NEXT X

TYPE THIS	READ THIS
NEW	
Ø5 HOME	
1Ø FOR X=1 TO 1Ø	This tells the computer it will count from 1 to 1Ø.
15 PRINT X	This tells the computer to put the number on the T.V.
2Ø NEXT X	This tells the computer to go to line 1Ø, add 1 to the count, and go down the program again.
RUN	Don't blink! Computers are very fast.



The computer goes around this circle 1Ø times.

Don't erase the last program. If you did, retype it. Change line 1Ø to any of the following lines. This will help you understand do loops. Try each line 1Ø.

```
1Ø FOR X=5 TO 2Ø
1Ø FOR X=25 TO 4Ø
1Ø FOR X=1ØØ TO 115
1Ø FOR X=-1Ø TO Ø
```

Experiment. Make up your own line 1Ø.

DO LOOP PRACTICE

Lesson Ten
Name _____

Type and RUN this program.

```
HOME:NEW
  Ø5 HOME
  1Ø FOR X=1 TO 12
  15 PRINT "**********"
  2Ø NEXT X
RUN
```

What happened? Answer _____

The next program does some math. Be careful, it is a hard program to type. Put a space before and after PLUS and IS in line 15.

```
HOME:NEW
Ø5 HOME
1Ø FOR X=3 TO 12
15 PRINT X; " PLUS "; X; " IS "; X+X
2Ø NEXT X
25 RUN
```

Be careful. This is a hard line to type.

You might have to debug the last program.
What happened? Answer _____

Now for a race. You will race the computer. You will both count to 1ØØ. Type this program.

```
NEW
Ø5 HOME
1Ø FOR X=1 TO 1ØØ
15 PRINT X
2Ø NEXT X
25 PRINT "THE COMPUTER IS DONE."
RUN
```


Push **RETURN** and start counting!

Who won? Answer _____

Experiment!

1. Change the last program. Fix it so you can win.
2. See if you can write your own program that has a do loop.

More Graphics

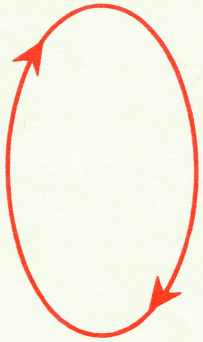
Suppose you wanted the whole T.V. one color. You could use the HLIN statement. But there are 40 lines on the T.V. (0 to 39). So, you'd have to type a 40 line program. The first part would look like this. DON'T TYPE THIS!

```
05 GR
10 COLOR= _
15 HLIN 0, 39 AT 0
20 HLIN 0, 39 AT 1
25 HLIN 0, 39 AT 2
30 HLIN 0, 39 AT 3
35 HLIN 0, 39 AT 4
40 HLIN 0, 39 AT 5
45 HLIN 0, 39 AT 6
50 HLIN 0, 39 AT 7
55 HLIN 0, 39 AT 8
60 HLIN 0, 39 AT 9
```

After this you'd still have 30 lines to type! There's an easier way. The computer can count from 0 to 39.

Study this program carefully. **The C stands for count.**

TYPE THIS	READ THIS
HOME:NEW	
Ø5 GR	
1Ø COLOR=7	
15 FOR C=Ø TO 39	The computer will count from Ø to 39. C stands for count.
2Ø HLIN Ø, 39 AT C	Each time through the loop a line is drawn. The first time it will be AT Ø. The second time it will be AT 1. And so on.
25 NEXT C	Makes the computer go to line 15. 1 is added to the count. Then it goes down the program again.



RUN

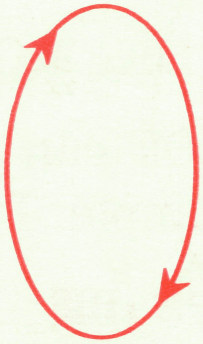
It goes around this loop 4Ø times. But, it is very fast. So, it looks like 1 step. Really it's 4Ø steps.

The computer only did one thing in the do loop. Why not have it do two things? Study this program carefully.

TYPE THIS	READ THIS
TEXT:HOME:NEW	Remember this?
Ø5 GR	
1Ø FOR C=Ø TO 15	Start of the do loop.
15 COLOR=C	Computer counts the color numbers. The first time it will be color Ø, Black. The second time it will be color 1, Red. And so on.
2Ø VLIN Ø, 39 AT C	Computer draws a line at Ø, then 1, and so on.
25 NEXT C	Makes the computer go to 1Ø. It adds 1 to the count. Then it goes down the program again.

RUN

It goes around this loop 16 (Ø to 15) times.



One more program. This one has something new in it!

TYPE THIS	READ THIS
TEXT:HOME:NEW	
Ø5 GR	
1Ø COLOR=3	
15 FOR C=1 TO 39	Starts the loop.
2Ø HLIN Ø, C AT C	Computer draws a line from Ø to the count. It will be from Ø to 1. Then from Ø to 2. And, so on.
25 NEXT C	Closes the loop.

PLOT can also be used inside a do loop. Here is an example. Type and RUN this program.

TYPE THIS	READ THIS
TEXT:HOME:NEW	
Ø5 GR	
1Ø COLOR=1	
15 FOR C=Ø TO 39	Starts the loop.
2Ø PLOT C, C	Lights block Ø, Ø, then 1, 1, then 2, 2. And so on.
25 NEXT C	Closes the loop.

STEP

The computer can count by two; Ø, 2, 4, 6, 8, 1Ø and so on. It can also count by 5; Ø, 5, 1Ø, 15, 2Ø and so on. It can count by any number. STEP is used to do this. STEP is used right after FOR __ TO __. The next program uses STEP. The computer will count by 2. Type and RUN the program.

```
TEXT:HOME:NEW
Ø5 GR
1Ø COLOR=14
15 FOR C=Ø TO 39 STEP 2
2Ø HLIN Ø, 39 AT C
25 NEXT C
```

Experiment with the last program. Change line 15. Try

STEP 3

STEP 4

STEP 1Ø

Things to Remember

STEP __ makes the computer count by the number after it. It can only be used in a FOR __ TO __ line.

DO LOOPS AND GRAPHICS

Lesson Eleven
Name _____

Finish the next program. It should make the top half of the T.V. red. It should make the bottom half green.

```
Ø5 _____
1Ø COLOR=____
15 FOR C= ____ TO ____
2Ø HLIN Ø, 39 AT ____
3Ø NEXT C
35 COLOR=____
4Ø FOR C= ____ TO ____
45 HLIN Ø, 39 AT ____
5Ø NEXT ____
```

RUN the program. Debug it if you need to.

Here is a program that uses STEP. Experiment with it. Try different STEP numbers. Also, change lines 2Ø and 3Ø. Try shorter lines.

```
TEXT:HOME:NEW
  Ø5 GR
  1Ø FOR C=Ø TO 39 STEP 2
  15 COLOR=1
  2Ø VLIN Ø, 39 AT C
  25 COLOR=5
  3Ø HLIN Ø, 39 AT C
  4Ø NEXT C
```

Write your neatest result below.

NOTES:

More Basic Words

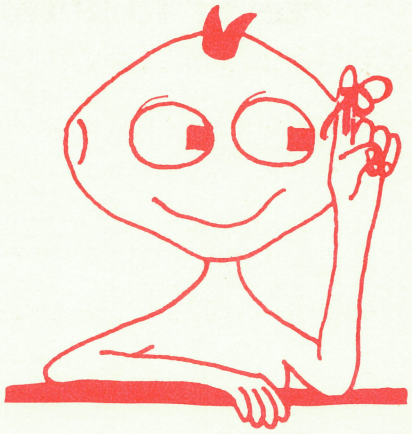
chapter 11

This chapter is full of new BASIC words. They will help you write more interesting programs.

REM

REM is short for remark. REM lines are ignored by the computer. Good programmers use a lot of REM lines. REM lines help people remember how a program works. Type and RUN the program below.

```
TEXT: HOME:NEW
Ø1 REM PROGRAM TO DRAW A PYRAMID
Ø5 GR
1Ø COLOR=12
15 FOR C=2Ø TO 39
2Ø REM RIGHT SIDE
25 PLOT C, C
3Ø REM LEFT SIDE
35 PLOT 39 - C, C
4Ø REM CLOSE DO LOOP
45 NEXT C
RUN
```



Things to Remember

REM lines are ignored by the computer. Use them to explain your program.

Now, take out lines Ø1, 2Ø, 3Ø, and 4Ø. Then TEXT:HOME:LIST the program. Now, RUN it again. It still works, but it's harder to read. YOU should start using REM lines in your programs. Use them to make your programs easier to understand.

RND ( )

RND is short for random. Random means without pattern. Random numbers are not in any order. You can get the computer to pick such numbers. You just type this line.

```
15 R = INT(1Ø*RND(1)) + 1
```

This line makes the computer pick a number. See the 1Ø in the line? The number will be between 1 and 1Ø. It will put this number in memory box R. You could put 1ØØ where the 1Ø is. Then the computer would pick a number from 1 to 1ØØ.

RUN the next two programs. Study the output to see how this line works.

Program 1

```
HOME:NEW
Ø5 REM PRINT 15 RANDOM NUMBERS
1Ø FOR C=1 TO 15
15 R = INT(1Ø*RND(1)) + 1
2Ø PRINT R
25 NEXT C
```

Be careful. This is a hard line to type.

Things to Remember

INT(1Ø*RND(1)) + 1 is used to pick a number. The "1Ø" can be any number.

PROGRAM 2

```
HOME:NEW
Ø5 REM PLOT BLOCKS IN A ROW
1Ø HOME
15 GR
2Ø COLOR=1
25 FOR C=1 TO 1ØØ
30 R = INT(39*RND(1)) + 1
35 PLOT R, 2Ø
4Ø NEXT C
```


The RND(1) line can be used more than once. The next program uses it 3 times. It is used to pick a color number. It is used twice to pick a block address. Study this program carefully.

TYPE THIS	READ THIS
TEXT:HOME:NEW	
05 REM KALEIDOSCOPE	
10 HOME	
15 GR	
20 C=INT(16*RND(1))	Picks a color from 0 to 15
25 X=INT(40*RND(1))	Picks a number from 0 to 39
30 Y=INT(40*RND(1))	Picks a number from 0 to 39
40 COLOR=C	Sets the color
45 PLOT X, Y	Lights a block
50 GOTO 20	Starts over at line 20
RUN	

Push RESET to stop the program.

INPUT

INPUT does two things. It prints on the screen. And, it stops a program to get input. Here's an example.

```
1Ø INPUT "HOW FAR DOWN (Ø-39) ";Y
```

Prints HOW FAR DOWN (Ø-39) ? on the screen and stops. The program will start again when you type a number. The next program shows how it works.

```
TEXT:HOME:NEW
Ø5 REM LINE DRAWING PROGRAM
1Ø TEXT
15 HOME
2Ø INPUT "HOW FAR DOWN (Ø-39) ";Y
25 GR
3Ø COLOR=7
35 HLIN Ø, 39 AT Y
4Ø FOR C = 1 TO 1ØØØ
45 NEXT C
5Ø GOTO 1Ø
RUN
```

These two lines make the computer count to 1ØØØ before it goes to line 1Ø.

Push RESET to stop the program.

Things to Remember

INPUT stops a program. The program will start after words or numbers are typed.

INPUT can also be used with strings. You just have to use the $ sign. Here's an example. Type and RUN this program.

```
TEXT:HOME:NEW
Ø5 REM PUT NAME IN A SENTENCE
1Ø HOME
15 INPUT "WHAT'S YOUR NAME "; N$
2Ø PRINT
25 PRINT N$; " IS A NICE NAME "
```

INPUT can also get several numbers at once. You just separate the numbers with commas. This is a very powerful idea. Try the next program and see.

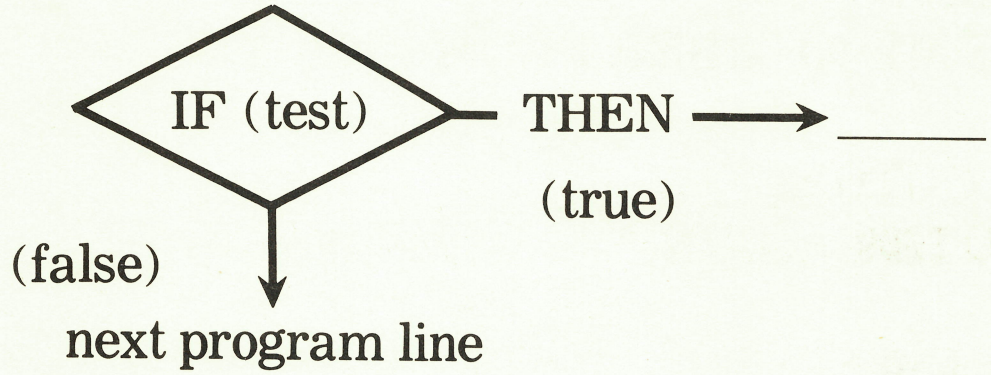
```
TEXT:HOME:NEW
  Ø5 REM PLOT PRACTICE
  1Ø TEXT
  15 HOME
  2Ø INPUT "TYPE A BLOCK ADDRESS  X, Y  "; X, Y
  25 GR
  3Ø COLOR=1
  4Ø PLOT X, Y
  45 FOR C=1 TO 1ØØØ
  5Ø NEXT C
  55 GOTO 1Ø
```


Experiment

1. Write a program using INPUT that draws up and down lines.
2. Design a program to randomly draw lines on the screen.

IF _ THEN _

IF _ THEN _ statements are used in programs to make decisions. Look at the diagram below.



A test is placed between IF and THEN. For example, G=N. If G **is** equal N, the computer will do what comes after THEN. If G is **not** equal N, the computer will just go to the next line. Lots of things can be placed after THEN. Examples include: GOTO, END, and PRINT statements. The next program uses an IF _ THEN _ line. Study the program carefully. RUN it several times.

Things to Remember

IF (test) THEN _ is used to make decisions.

```
TEXT:HOME:NEW
Ø5 REM GUESSING GAME
1Ø TEXT
15 HOME
2Ø N = INT(1Ø*RND(1)) + 1
25 PRINT "GUESS MY NUMBER FROM 1-1Ø"
3Ø INPUT G
35 IF G=N THEN GOTO 5Ø
4Ø PRINT "NOPE. TRY AGAIN."
45 GOTO 3Ø
5Ø PRINT "GOOD JOB"
```


IF __ THEN __ statements also work with strings. It just takes a different test. An example is X$= "YES". Add these lines to the last program. RUN it several times.

```
55 INPUT "AGAIN (YES/NO)"; A$
6Ø IF A$="YES" THEN GOTO 15
```

Experiment

1. Design a true-false test on the computer. (Hint: use IF A$="TRUE" THEN C=C+1 lines to count the number right.)
2. Design a program that lights blocks. Test each input to be sure it's not too large.

Things to Remember

READ & DATA must both be used in a program. They allow for easy entry of many numbers or letters.

READ & DATA

Remember PLOT graphics? They took a lot of typing. Luckily, there's an easier way. Using READ & DATA is one easier way. As before, you'll need an address. You put these numbers into DATA lines. They have this form:

```
DATA X, Y, X, Y, X, Y, X, Y, X, Y, X, Y,
DATA X, Y, X, Y, X, Y, X, Y, X, Y, X, Y and so on.
```

Then you put a READ X, Y line inside a do loop. Here's a sample program.

```
TEXT:HOME:NEW
Ø5 REM READ & DATA DEMO
1Ø GR
15 COLOR=9
2Ø READ X, Y
3Ø IF X = -1 THEN 99
4Ø PLOT X, Y
5Ø GOTO 2Ø
6Ø DATA Ø, Ø, 39, Ø, 39, 39
7Ø DATA Ø, 39, 2Ø, 2Ø, -1, -1
99 END
RUN
```


Experiment

1. You can add all the DATA lines you want. Remember to put -1, -1 in the last DATA line. This tells line 3Ø (IF __ THEN __ line) when you're done.
2. Design a program with READ & DATA to do some math.

APPENDICES

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E. Suggestions for Teachers and Parents . . . 121

F. Sample Graphic Pictures 130

APPENDIX A
Sample Programs

```
Ø5 REM FAST RANDOM LINES
1Ø GR
15 X = INT(39*RND(1)) + 1
2Ø Y = INT(39*RND(1)) + 1
25 C = INT(15*RND(1)) + 1
3Ø COLOR=C
35 VLIN Ø, Y AT X
4Ø HLIN Ø, X AT Y
45 GOTO 15
```

```
Ø5 REM X-OUT
1Ø GR
15 COLOR=1
2Ø FOR X=Ø TO 39
25 PLOT X, X
3Ø PLOT 39 - X, X
35 NEXT X
```

```
Ø5 REM CLOCK
1Ø REM USES A LOOP IN A LOOP
15 FOR X=1 TO 6Ø
2Ø FOR T=1 TO 78Ø
25 NEXT T
3Ø PRINT X
35 NEXT X
```

```
Ø5 REM TAB DEMONSTRATION
1Ø FOR X=1 TO 2Ø
15 PRINT TAB (X); X; " < - - - - TAB POSITION"
2Ø NEXT X
25 PRINT "AND SO ON- - - -  >"
```

```
Ø1  REM ***BIG LETTERS***
Ø5  REM SEE APPENDIX F
1Ø  REM FOR MORE IDEAS
15  GR:COLOR=2
2Ø  VLIN 16, 22 AT 8
25  VLIN 19, 22 AT 12
3Ø  VLIN 19, 22 AT 15
35  VLIN 19, 22 AT 22
4Ø  VLIN 19, 22 AT 26
45  VLIN 2Ø, 21 AT 3Ø
5Ø  VLIN 2Ø, 21 AT 33
55  HLIN 8, 11 AT 19
6Ø  HLIN 15, 18 AT 19
65  HLIN 15, 18 AT 2Ø
7Ø  HLIN 15, 18 AT 22
75  HLIN 31, 32 AT 19
8Ø  HLIN 31, 32 AT 22
```

```
Ø1  REM ANIMATION DEMO
Ø5  GR
1Ø  FOR X=1 TO 39
15  COLOR=13
2Ø  PLOT X, 2Ø
3Ø  COLOR=Ø
35  PLOT X - 1, 2Ø
4Ø  NEXT X
45  PLOT 39, 2Ø
99  GOTO 1Ø
```

```
Ø5  REM STRING MANIPULATION
1Ø  REM STUDY THE NEW WORDS
15  REM IN THE APPLE MANUAL
2Ø  HOME
3Ø  INPUT "WHAT'S YOUR NAME"; N$
35  FOR X=1 TO LEN (N$)
4Ø  L$ = LEFT $ (N$,X)
5Ø  PRINT L$
6Ø  NEXT X
```

```
Ø5 REM BLOCK ADDRESS TUTOR
1Ø HOME
15 PRINT "TYPE A BLOCK ADDRESS"
2Ø PRINT "IT MUST HAVE 2 NUMBERS"
25 PRINT "SEPARATED BY A COMMA"
3Ø PRINT "USE NUMBERS FROM Ø TO 39"
35 INPUT X, Y
4Ø GR
45 COLOR=12
5Ø PLOT X, Y
55 GOTO 35
```

```
05 REM HLIN TUTOR
10 HOME
15 PRINT TAB(11) "***HLIN TUTOR***"
20 PRINT:PRINT
25 PRINT "WHERE DO YOU WANT YOUR LINE?"
30 PRINT:PRINT
35 PRINT "TYPE A NUMBER"
40 PRINT:PRINT
45 PRINT "USE A NUMBER FROM 0 TO 39"
50 INPUT A
55 GR
60 COLOR=3
65 HLIN 0, 39 AT A
70 GOTO 50
```

```
05 REM PUSH-PUSH PROGRAM
10 TEXT:HOME
15 FOR X=0 TO 243
20 PRINT TAB(X+1) "----->PUSH"
25 VTAB 1
30 FOR C = 1 TO 100:NEXT C
35 NEXT X
```

```
Ø5 REM PUSH-PUSH PROGRAM
1Ø TEXT:HOME
15 FOR X=Ø TO 243
2Ø PRINT TAB(X+1) "-----> PUSH"
25 VTAB 1
3Ø FOR C = 1 TO 1ØØ:NEXT C
35 NEXT X
```

```
Ø5 REM LAZER GUN
1Ø GR:COLOR=1
15 INPUT " PUSH RETURN " ; A$
2Ø IF A$ < > "       " THEN 3Ø
25 GOTO 1Ø
3Ø FOR X = Ø TO 15
35 COLOR=1
4Ø PLOT X, 39 - X
5Ø PLOT 3Ø - X, 39 - X
6Ø NEXT X
7Ø GOTO 1Ø
```

APPENDIX B

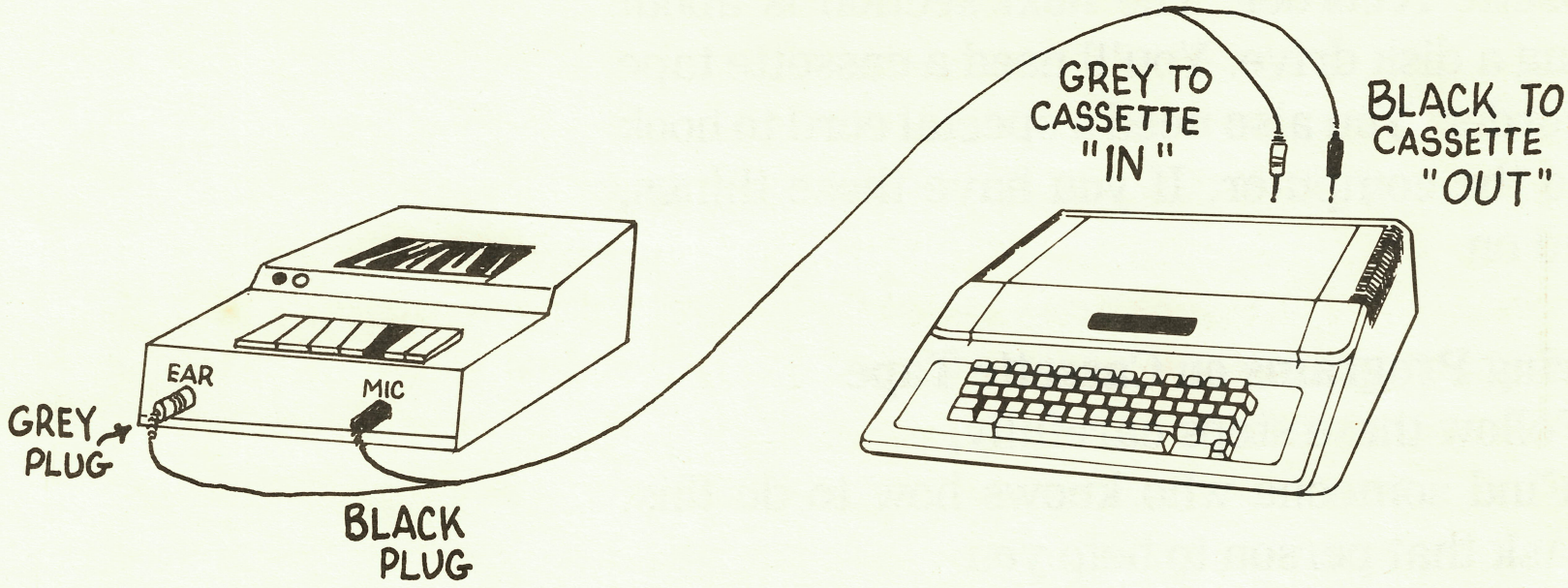
Saving Programs on Cassette Tape

When you turn the computer off, your program is erased. There are two ways to save your program. You can save programs on disks or cassettes. This section is about using a cassette recorder. The next section is about using a disk drive. You'll need a cassette tape recorder. You also need a special cord to hook it to the computer. If you have these things, read on.

Saving Programs on Cassette Tape

Follow these steps carefully.

1. Find someone who knows how to do this. Ask that person to help you.
2. Get a **very good** new cassette tape. It should not have music or talk on it.
3. Be sure the recorder is plugged in right. Study the picture on the next page.


GREY TO
CASSETTE
"IN"
BLACK TO
CASSETTE
"OUT"
EAR
MIC
GREY
PLUG
BLACK
PLUG

4. Rewind the tape.
5. If you have a tape counter, set it to Ø.
6. Push the PLAY button. Run the tape ahead to 1Ø on the counter.
7. Write down the number on the tape counter. You'll need it later to find your program. Also write down what your program does.
8. Type SAVE on the computer. **Do not** press RETURN yet.
9. Press down the PLAY and RECORD buttons. They should both stay down.
10. Press RETURN on the computer. The computer will beep when it starts to record. When it stops recording it will also beep. Then you'll see the cursor on the T.V.
11. Do all this over again. Leave a little room on the tape before your second SAVE.

Caution

When you're done, **push the stop button on the recorder.** This protects the recorder. Never leave a button down on a recorder. It can mess up the recorder.

Using Recorded Programs

To use a recorded program do this:

1. Put the tape into the recorder. Be sure the side you want is up.
2. Rewind the tape. Set the tape counter to zero.
3. Look at the tape counter. Run the tape ahead to the start of your program.
4. Rewind the tape just a little.
5. Type LOAD program on the computer.
6. Push **only** the PLAY button down.
7. Push the RETURN button on the computer. The T.V. will go blank. Wait quite a long time.
8. When done the computer will put the cursor on the screen. Now you can RUN the program.
9. If this does not work, **try again!**

Caution

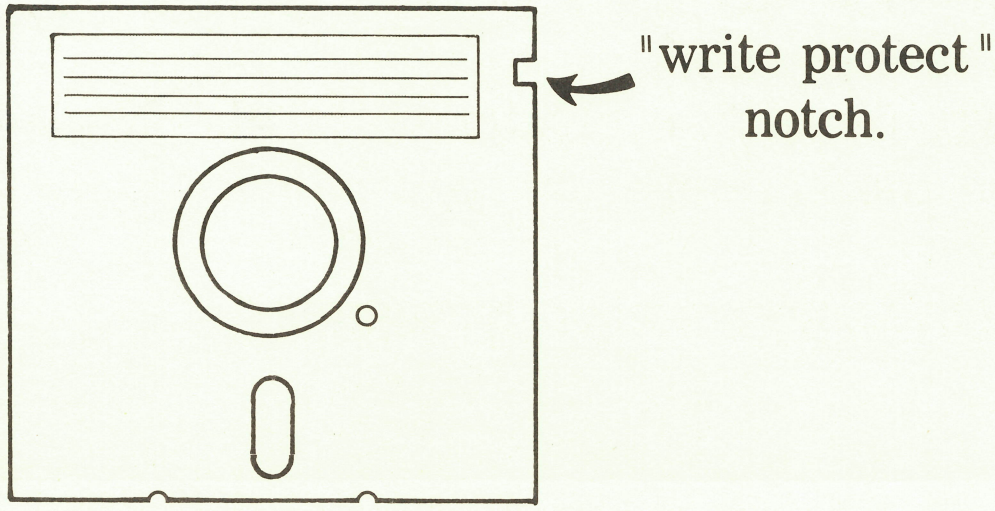
When done, push the stop button on the recorder. This protects the recorder.

APPENDIX C

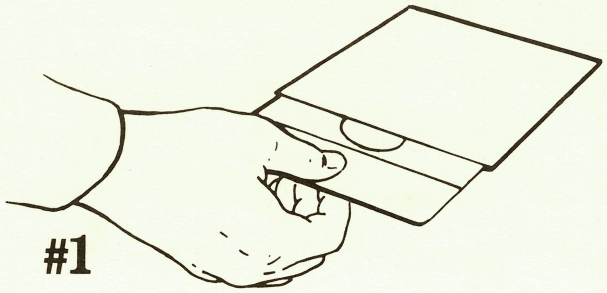
Saving Programs On Disks

Saving programs on disks is very easy. But, some disks should **not** have programs recorded on them.

1. Ask someone who knows which disk you should use.
2. Look at the next page. Study it carefully. Disks must be handled very carefully!
3. A disk has a "write protect" notch. Find this notch in the picture below. You **cannot** save a program when this notch is covered up. But, **don't uncover a "write protect" notch without asking someone.**



How to Handle Disks



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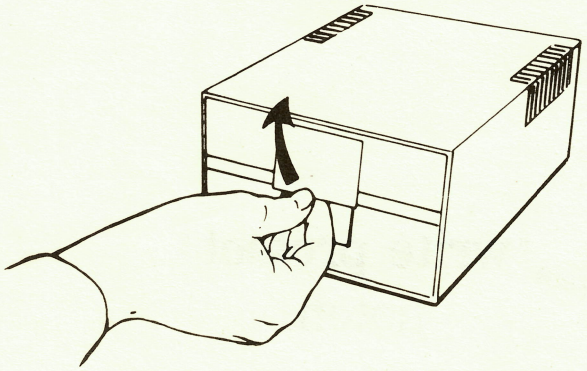

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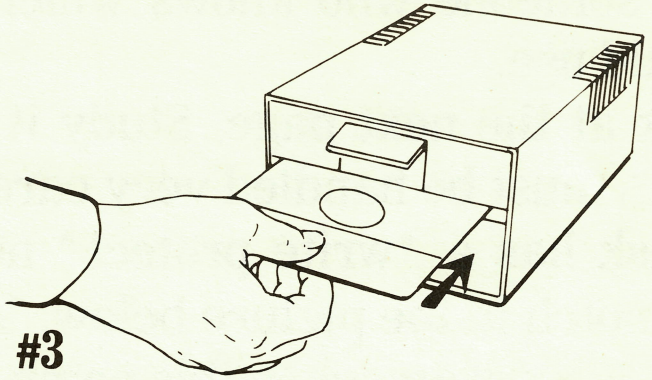

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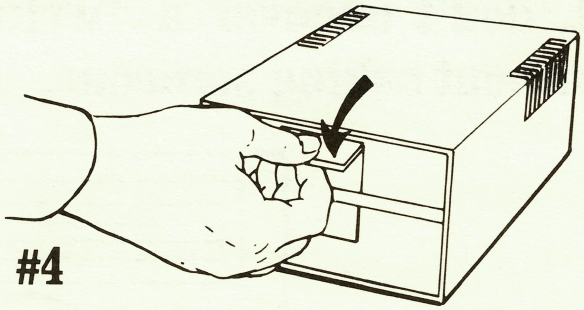


#4

4. Gently put the disk in the drive slot. Oval opening should go first. Label should be up. Then close the drive door.
5. Think up a name for your program.
6. Type SAVE *program name* and push RETURN.
7. You'll hear the disk spin for a few seconds. The computer will put the cursor on the T.V.

Getting Programs from Disk

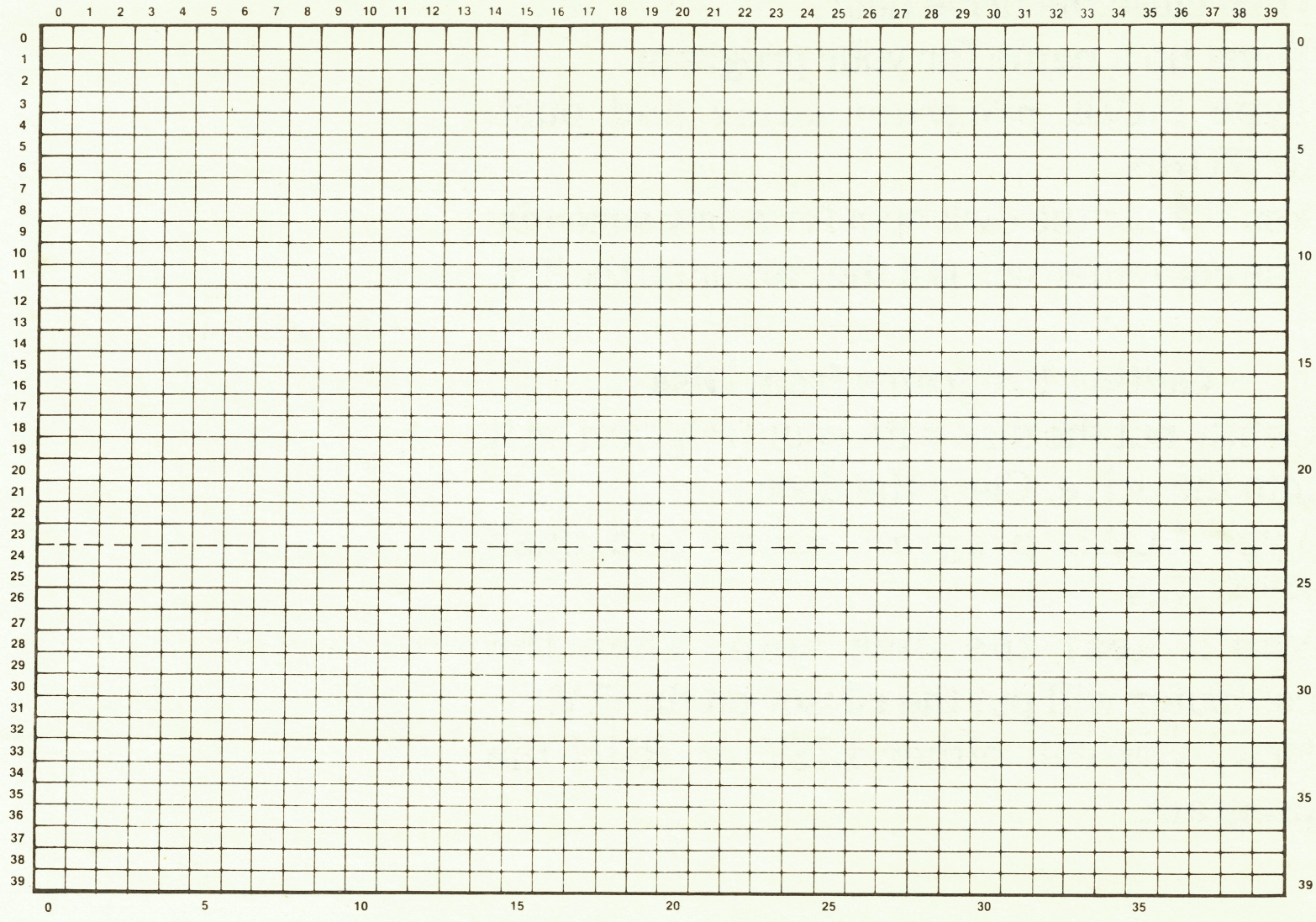
1. Gently put the disk with your program on it into the drive. Close the door.
2. Type LOAD *program name* and push RETURN.
3. You'll hear the disk spin. Then the computer will put the cursor on the T.V.
4. Now, you can either LIST or RUN the program.

APPENDIX D

Graphics Screen Locations

FIRST COUNT OVER → THEN COUNT DOWN ↓

START



APPENDIX E

Suggestions For Teachers & Parents

NOTE: TEACHING COMPUTER PROGRAMMING TO KIDS AND OTHER BEGINNERS, a notebook by the author, serves as a teacher's manual for the present volume. It has dozens of lessons, activities, and suggestions for teaching programming. In addition, it contains lessons specifically designed to introduce the present volume. Although not critical, it would be highly desirable for the reader to use this manual before and along with the present volume.

General Suggestions

1. If at all possible, get one copy of this book for each student. Let the kids mark in the book and put notes in the margins. If you can't get a copy for everyone, have every student keep a notebook of what they've learned.
2. Encourage students to read ahead in their free time. If they do, they won't waste as much time when they're at the computer.
3. For best results, each student needs two, one-half hour sessions at the computer each week. One session per week is a minimum. Most teachers pair up students. This is helpful because one can often see errors and understand words the other one might miss.
4. If you have some computer games, save them until later. Do **not** use them initially because most students would rather play games than learn to program. Later, you can **use the game tapes as rewards** for well written, original, student programs.

5. Get a chapter or two ahead of the kids. You don't have to be an excellent programmer to teach programming but you do have to stay a chapter or two ahead of the kids. It would also be helpful if you studied the Apple II manuals that came with the computer.
6. Build a cadre of expert kids. Let a few older students in your school or neighborhood quickly learn to program your computer. Then, get them to help you teach the younger kids to program. (Sometimes one kid can explain something to another better than an adult.)
7. Empathize with frustrated kids. Let's face it, it's hard to get a program to work exactly right the first time. Most programs must be "debugged." Kids aren't used to doing something over and over again until it's right. Be as understanding and helpful as you possibly can.
8. You'll constantly need to encourage kids to try writing their own programs. Doing what's in this manual (except for the Experiment sections) isn't programming. It's studying and typing. Eventually, kids will need to write their own **original** programs.
9. This manual uses graphics as a vehicle for motivating students to write their own programs. Make this as easy as possible for kids by making extra graphics layout sheets readily available. Hold computer **Art** classes and have a contest every month for the best computer graphic.
10. Very young students, grades K2, who are poor readers might have trouble reading this manual. There are two ways you can eliminate this problem. First, you can pair up a good reader and a poor reader. Second, you can have

a parent volunteer or aid help the poor readers. If you do have an adult help, instruct them **not** to push the keys for the kids.

11. In pilot testing it was found that students weren't very interested in an approach that emphasized PRINT statements. They viewed PRINT lines as a bit of a gyp, e.g., you type 1Ø PRINT " HELLO " and the computer gives you one word instead of the 3 you typed. Hence, PRINT is emphasized less in this manual than some other manuals. You are certainly welcome to increase the emphasis on PRINT statements if you feel such an emphasis is beneficial.
12. Enjoy — this manual is intended to be pretty much self instructional. Sit back and watch the students learn — just help them over the hurdles.

Suggestions Regarding Hardware

1. This manual assumes that you have a color monitor attached to the Apple II. If you have a black and white monitor, the graphics programs in this manual will run but they will not run as described in the text. They will also not be as interesting to students.
2. Recently, Apple II computers have been coming from the factory with BASIC resident in ROM. That means they can be programmed in BASIC without disk drives or a cassette recorder connected. If you have disk drives, and a lot of beginning student programmers are going to use your computer, disconnect the drives. This will reduce turn-on time and hassles. During about the first half or more of this book the students have no need to save programs. (The programs are short enough that they can be easily entered by the students.)
3. Apple's Text versus Graphics mode can cause problems for beginning programmers, especially very young ones. Clearly describing this situation to the students, frequently reminding them of it, and placing a sign about it by the computer are about all that can be done. (It would sure be nice if in the future Apple computers would put Text and Home keys on their computers or at least configure them to default to the Text mode.)
4. In a classroom situation, it is better to instruct kids not to turn the computer off. This saves "wear and tear" on the computer and it also saves "turn on time." Simply have students type HOME and NEW to clear the screen before they begin progamming.
5. If students are going to use a cassette tape recorder **you will need to** determine what volume level works and put a piece of tape over the volume control.

6. Static electricity can be a problem around computers. This is especially true if you have carpet on the floor and the indoor relative humidity is low. You might need to teach the kids to "ground themselves out" by touching a metal desk or similar object before touching the computer.
7. In general, the more you can teach kids about computer hardware the better. If they know how it works they can take better care of it. This applies to teaching such things as "disks are a magnetic medium," "key contacts can get dirty," etc. If you have very little knowledge in this area, invite someone who knows about these things to talk to your kids.

Specific Suggestions

Chapters 1–2

Show the students the computer. Point out the various parts (see chapter two). Discuss classroom procedures for signing-up to use the computer. Post and talk with the students about the rules for computer use.

Chapter 3

Before you allow students to use the computer tell them about the function of the **SHIFT** and **RETURN** keys. Be sure to tell them that the zero on the keyboard has a line through it (Ø). Younger students will usually spend several sessions at the computer just typing.

Chapter 4

Before students start on this chapter, explain the TEXT and GRAPHICS modes. Specifically, teach them that to go from GRAPHICS to TEXT they will need to type:

TEXT RETURN
HOME RETURN
LIST RETURN

In this chapter students practice using the PLOT statement and typing. Block addresses are explained later.

Now would be a good time to start keeping a master list of BASIC words learned on the chalkboard or on a large poster. Also, put the IMPORTANT BASIC WORDS chart and the COLOR NUMBER CHART by the computer for quick student reference.

Chapter 5

This chapter teaches the use of an X,Y (over,down) coordinate system. Older students who have had graphing in math will breeze through this chapter. Younger students may need additional help from the teacher. Type in one of the **BLOCK ADDRESS TUTORIAL** programs (Appendix A) and let each student run the program several times. (Once you've typed and debugged the program save it on cassette or disk for future use.)

This chapter also introduces a very useful "shortcut," multiple statement lines, e.g., TEXT:HOME:LIST. For older students, explain this BASIC feature, but discourage them from using it in their programs. It makes reading programs much more difficult for them. For younger students, just let them use it as a "short cut" — explaining it might confuse them.

Chapter 6

The lesson in this chapter, Your Own Design, is very important. Students need to be continually encouraged to write original programs. Just doing what's in this book isn't programming, it's typing and studying. Whenever you see an **Experiment** section in this manual, let students put the book aside and write a few of their own programs. Now would be a good time for a graphic design contest.

Chapter 7

This should be a very rewarding chapter for students. VLIN and HLIN are very powerful BASIC statements. Younger students may, however, need some additional tutoring to firmly grasp the use of these statements. Use the terminology; FROM TO DOWN, or FROM TO OVER.

Chapter 8

Chapter eight introduces quite a few new concepts. Be certain students understand PRINT punctuation (commas and semicolons), GOTO and STRINGS before they move on to Chapter 9.

The ability to use the computer in calculator mode (just typing PRINT 2+2 without a line number) was purposefully not covered because it's easier just to use a hand held calculator. You're welcome to tell students of this feature of the computer.

Chapter 9

This is probably the most critical chapter in the book. Anyone who wants to become a proficient programmer must have a thorough understanding of do loops. (Some authors call these FOR-NEXT loops.) Take plenty of time to explain to anyone having difficulty how a do loop works. For younger students simulate a do loop by having a child role play a computer as it executes a program with a do loop in it. Keep the count on the chalkboard as the student does the task over and over again. For older students, you might want to discuss loops inside loops or " nested loops. "

Chapter 10

Very few new BASIC words are introduced in this chapter but the ability to read and understand how a program works becomes pretty significant in this chapter. Put several short programs on the chalkboard and teach students how to read and understand what the programs do without actually typing them into the computer.

Chapter 11

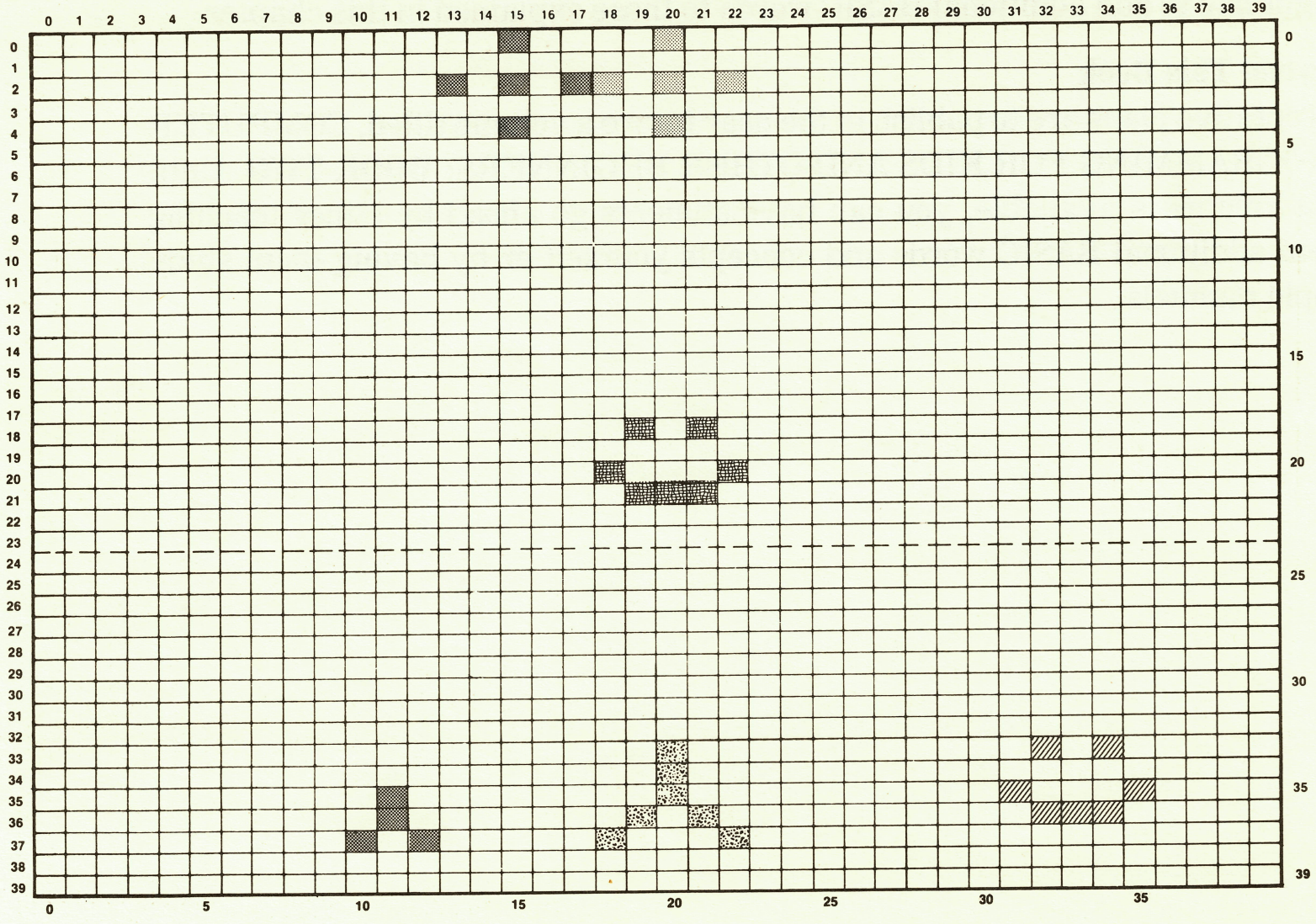
The main purpose of this chapter is to introduce a few new BASIC words. You might like to add additional BASIC words to those explained in this chapter.

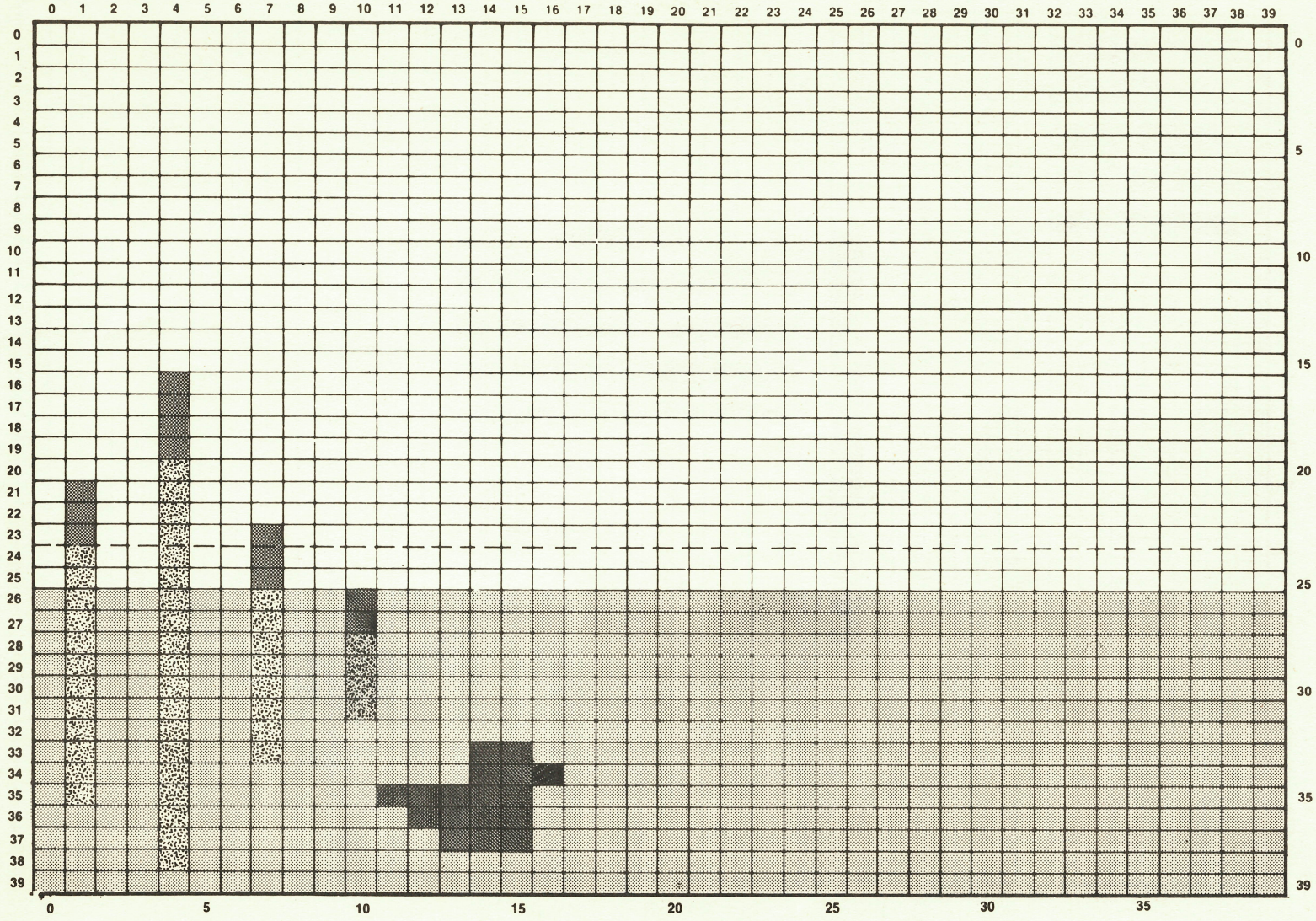
Beyond This Book

Tentative plans are to publish in the near future a volume titled, COMPUTER PROGRAMMING FOR KIDS AND OTHER BEGINNERS: **BOOK TWO**. Until that volume is available, you can have students go ahead by either teaching them additional BASIC words and concepts yourself or by having them study Apple manuals.

APPENDIX F

Sample Graphic Pictures

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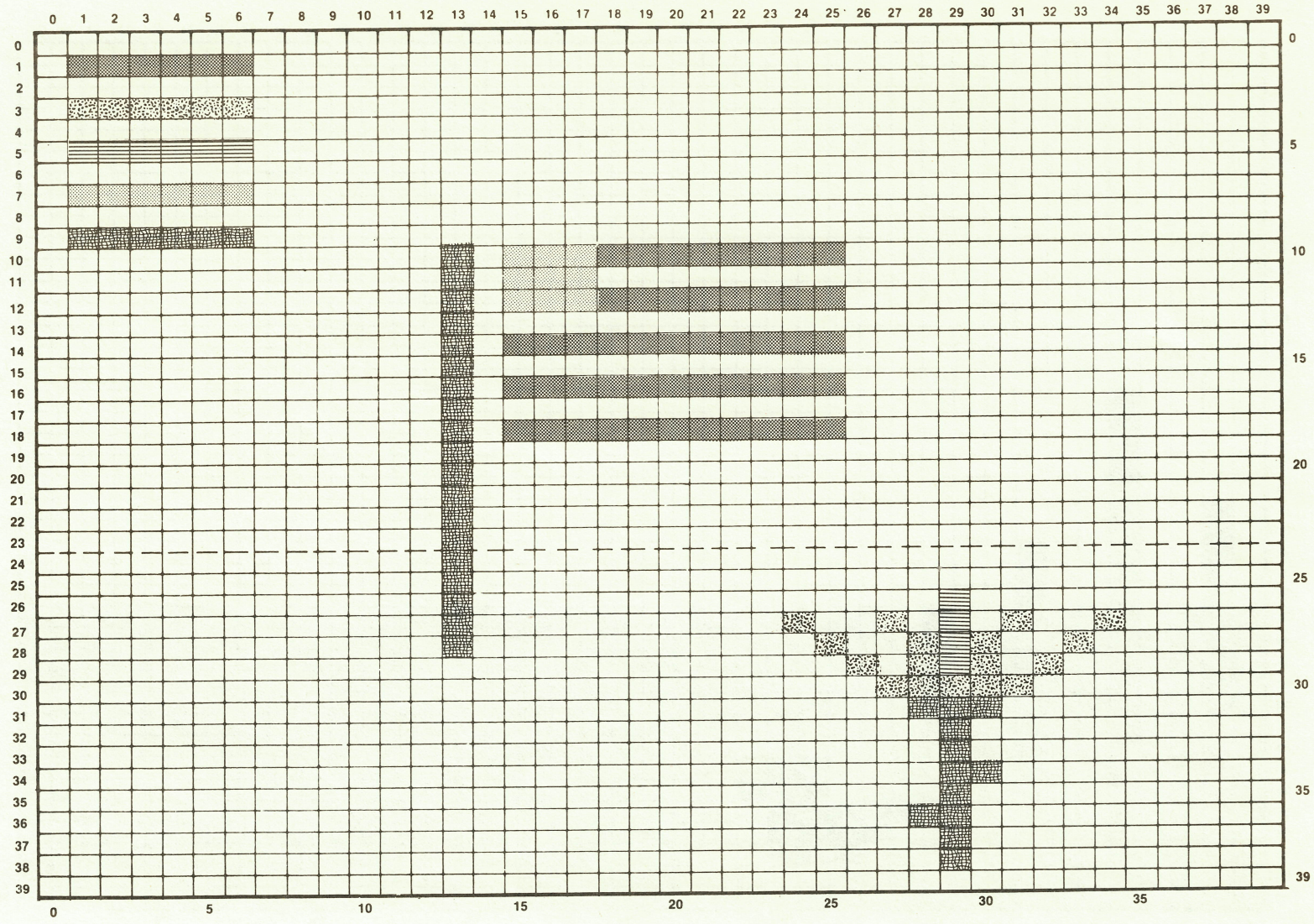
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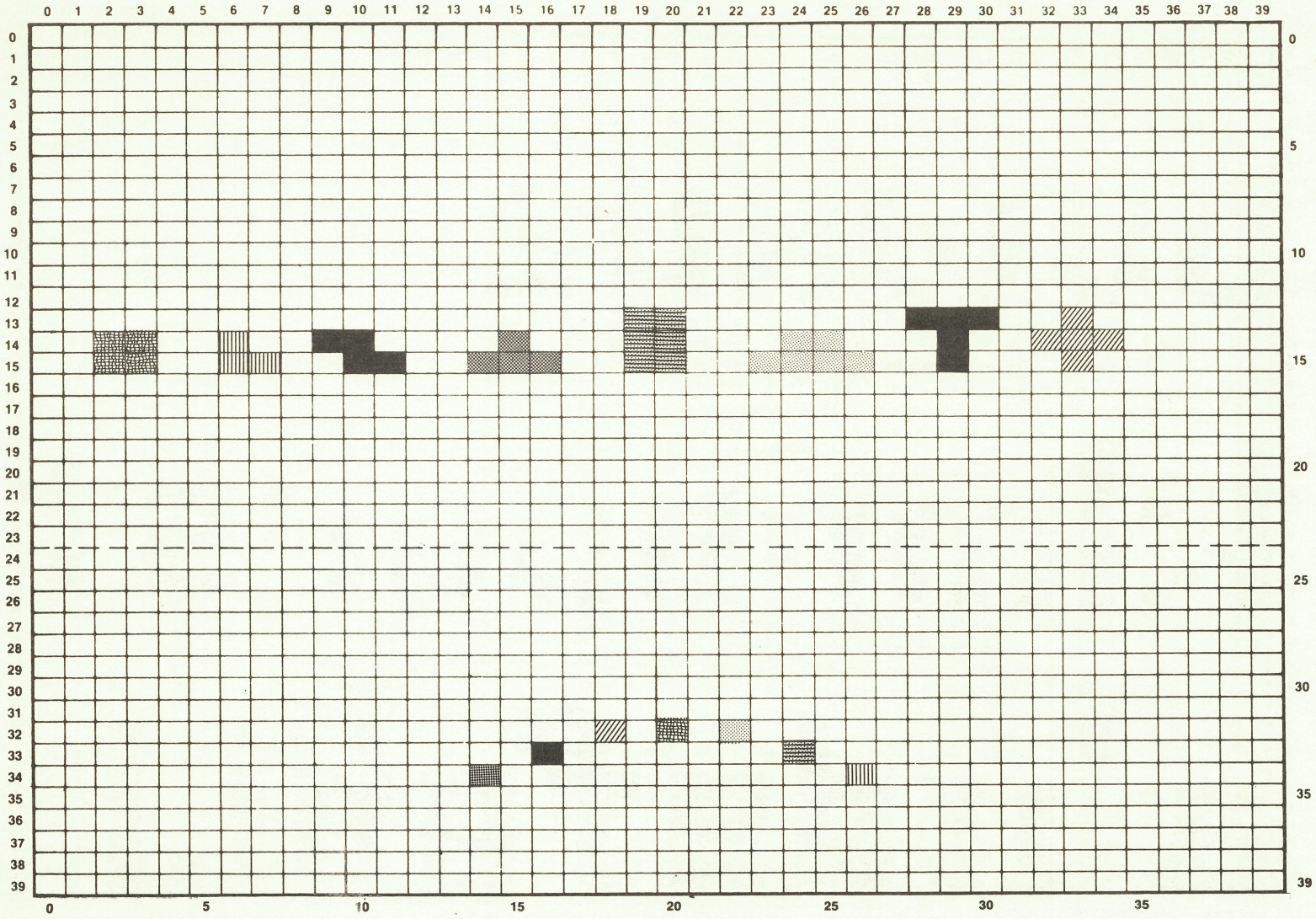

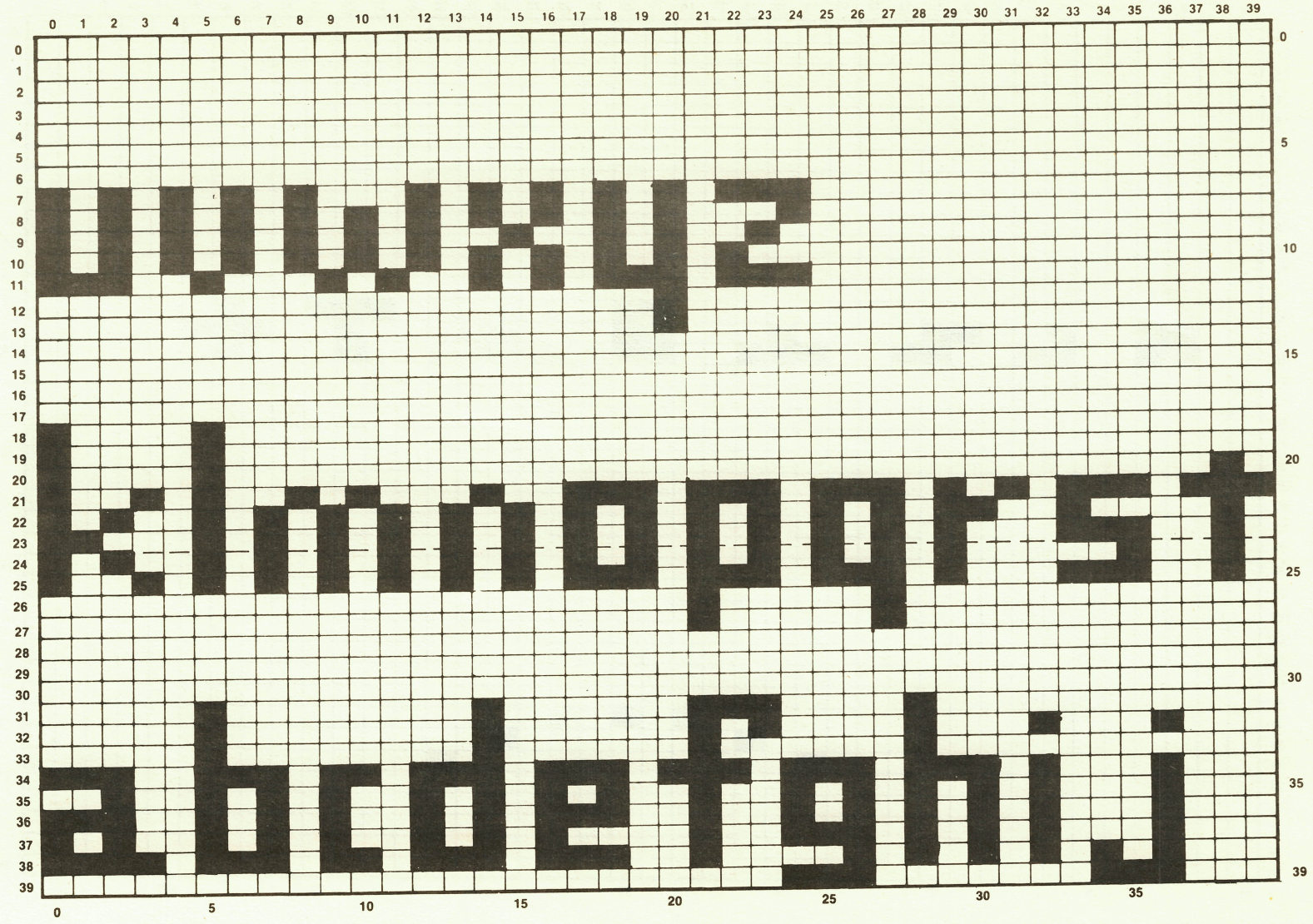
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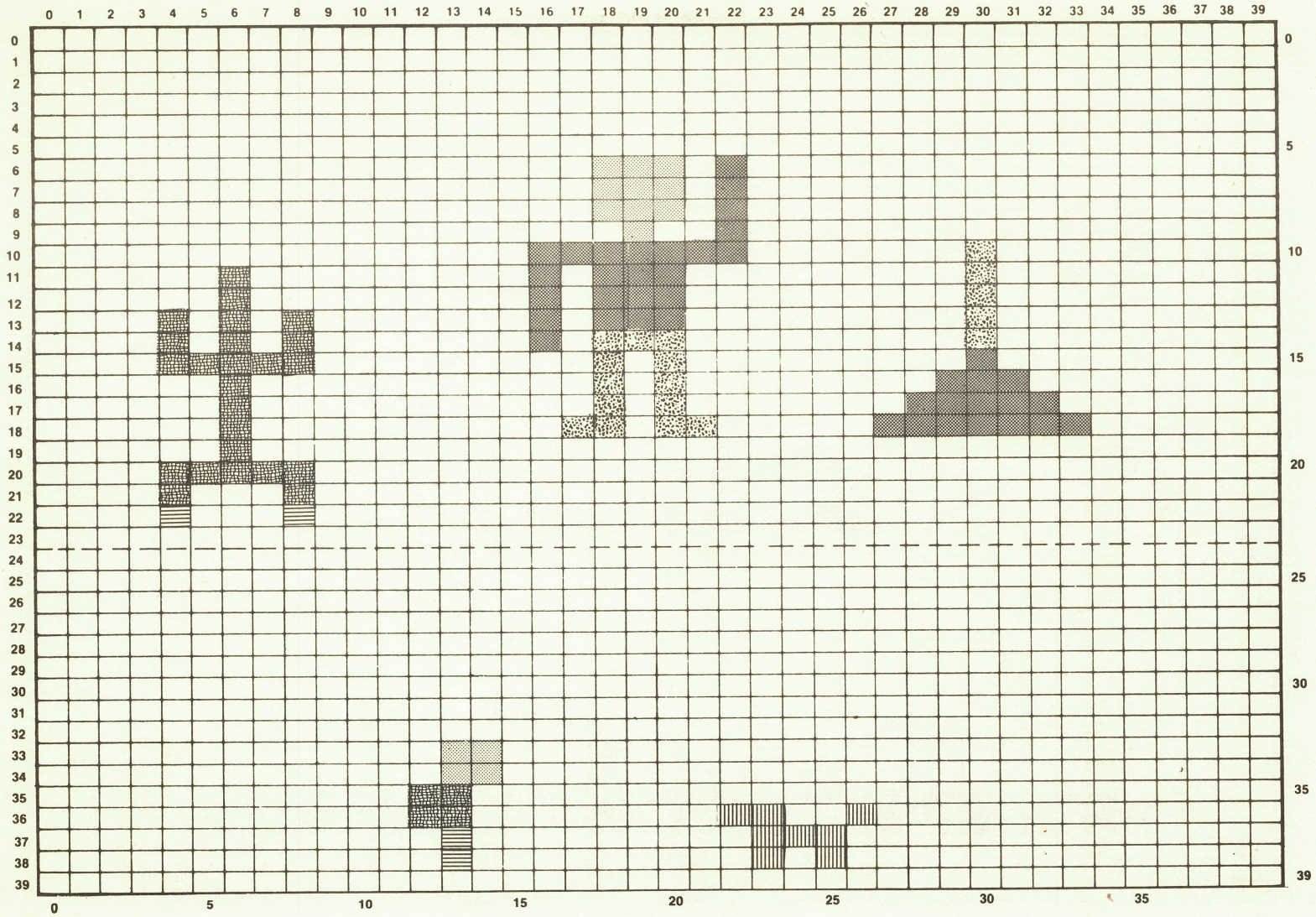

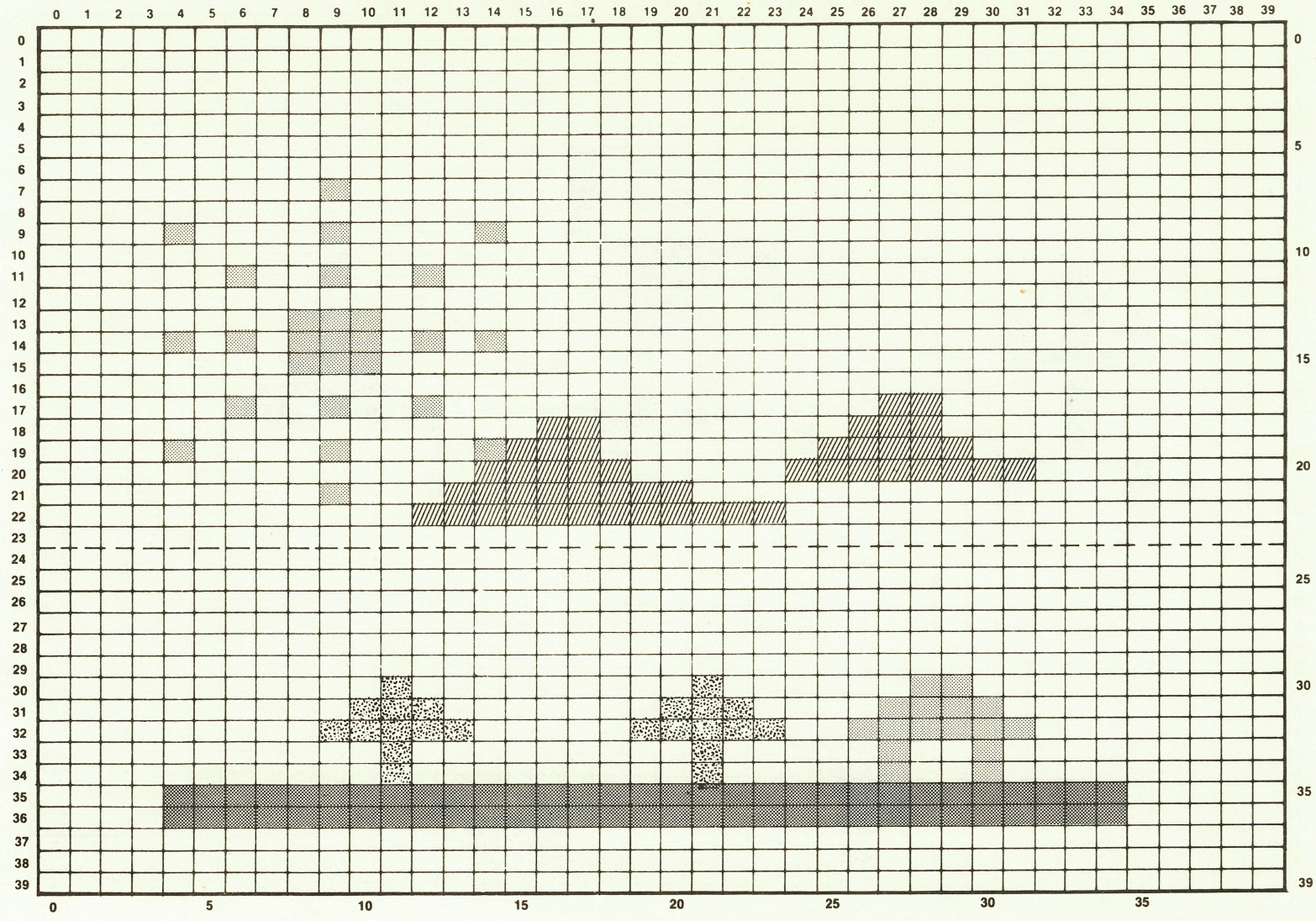
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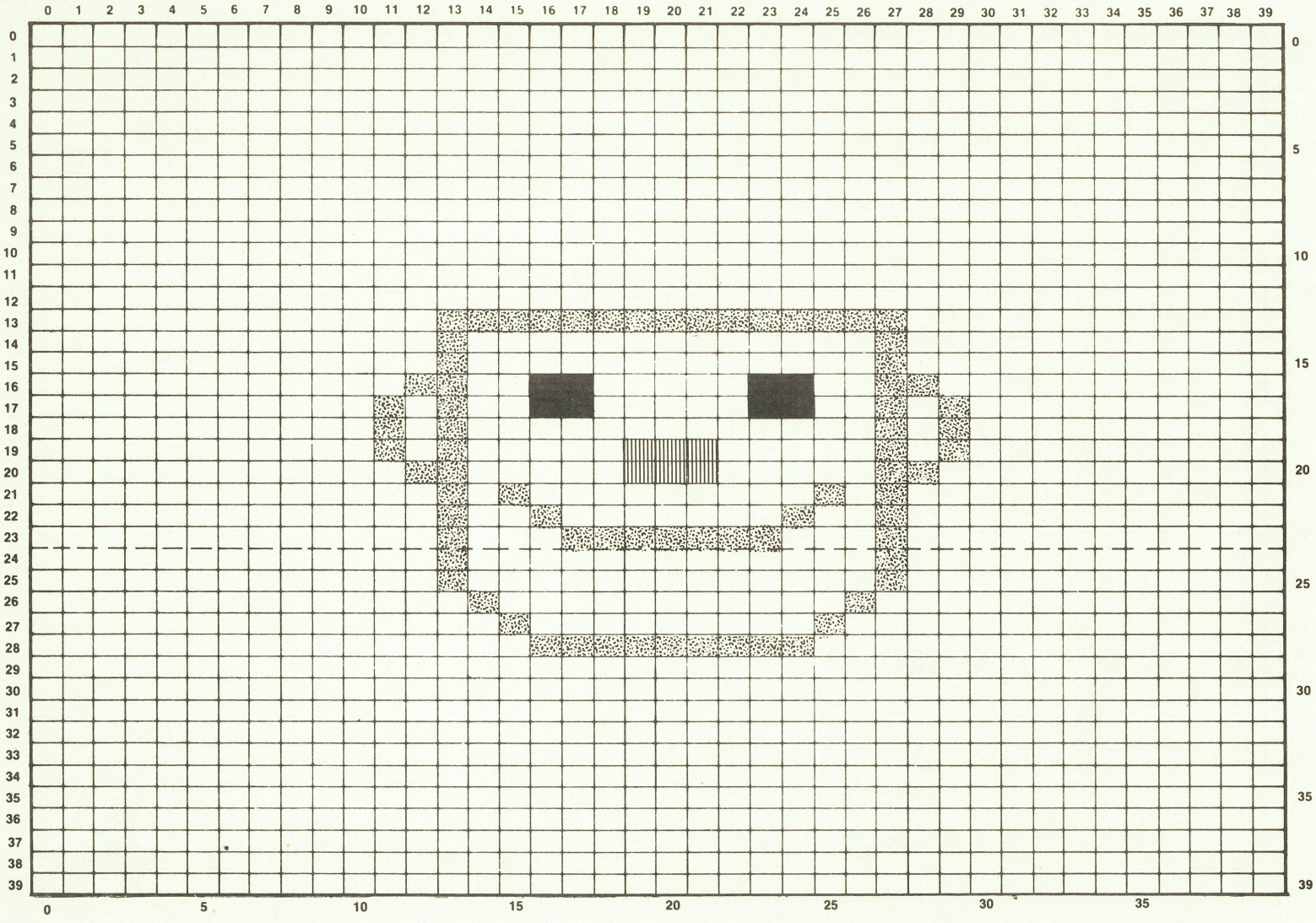

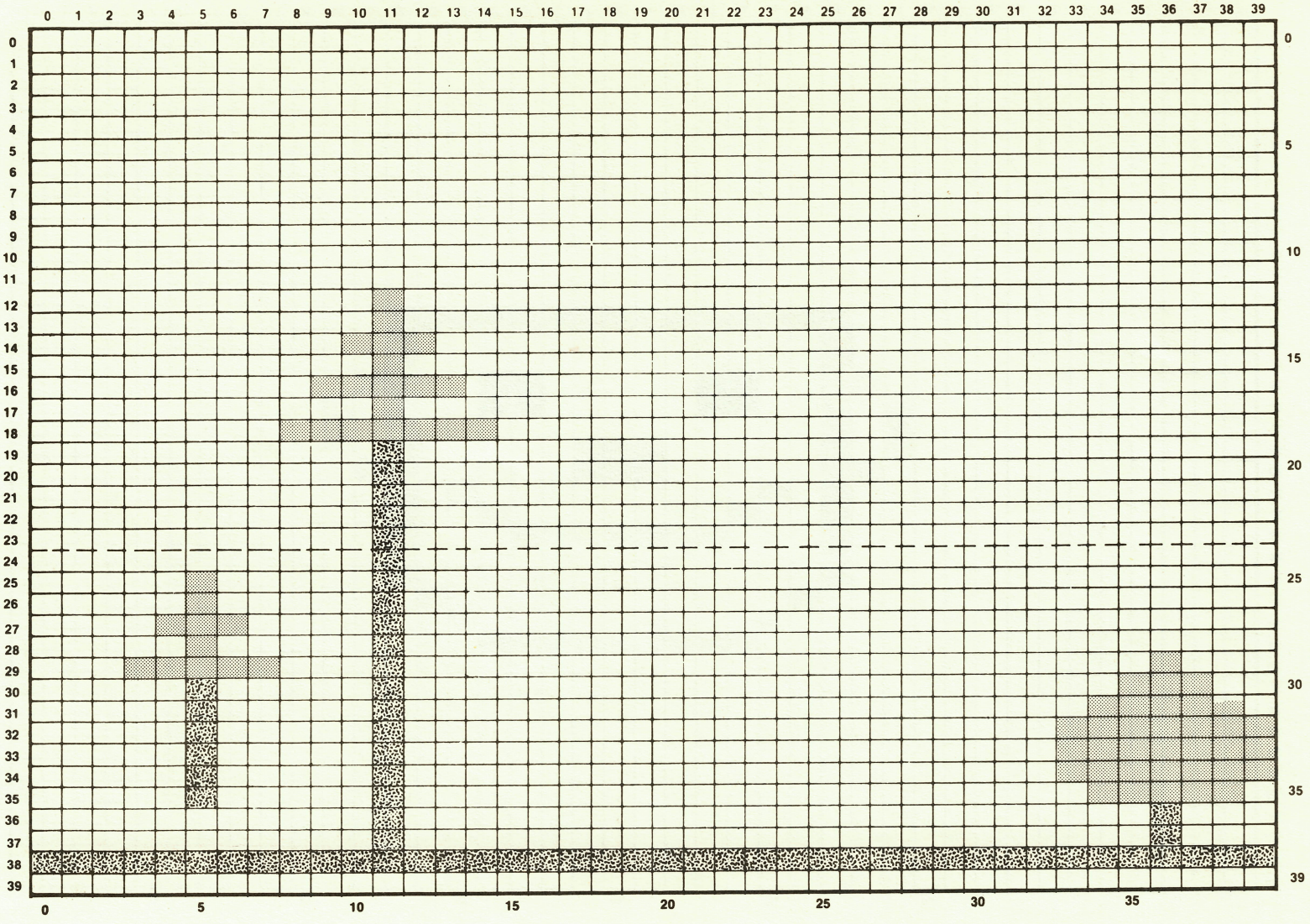
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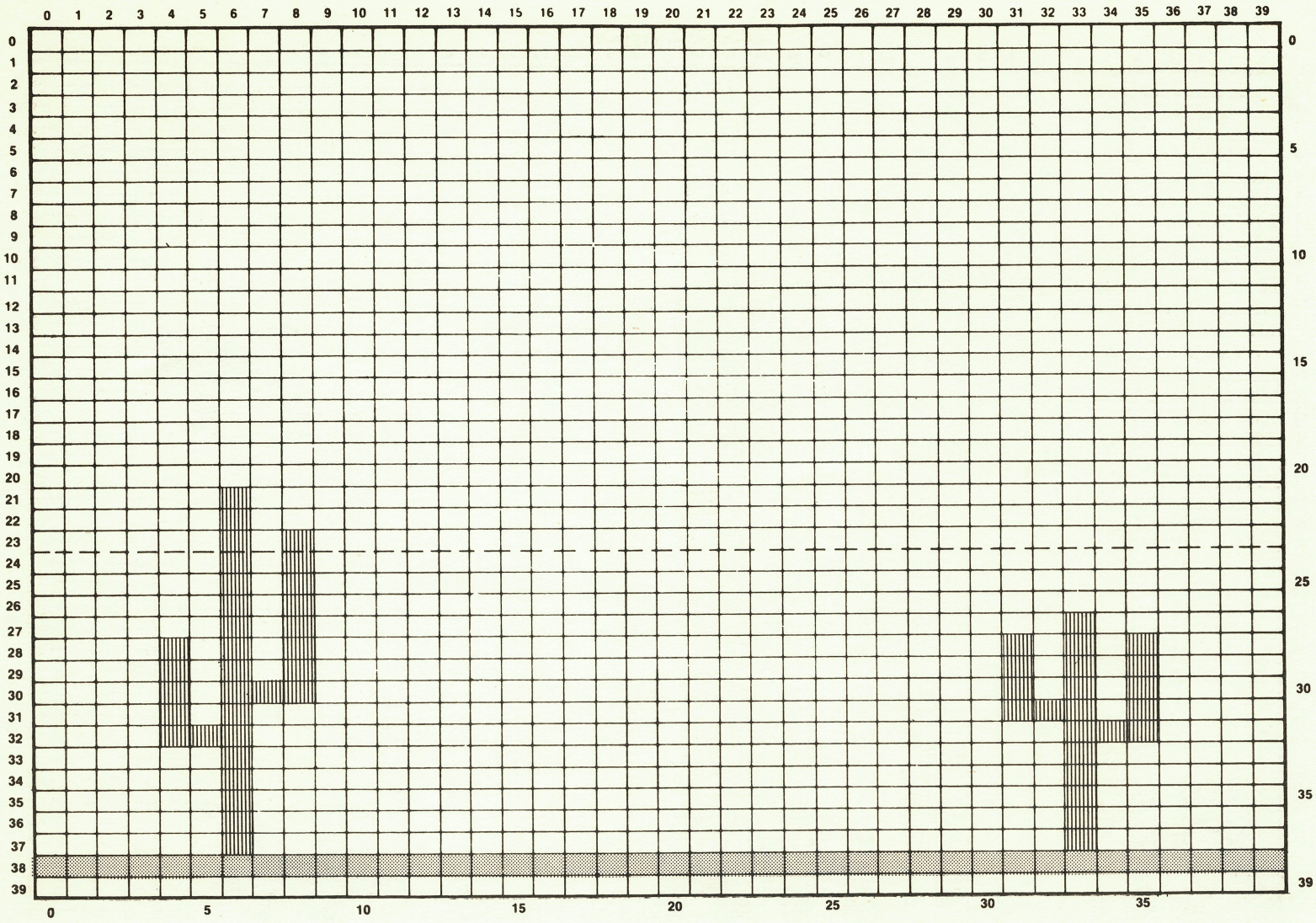

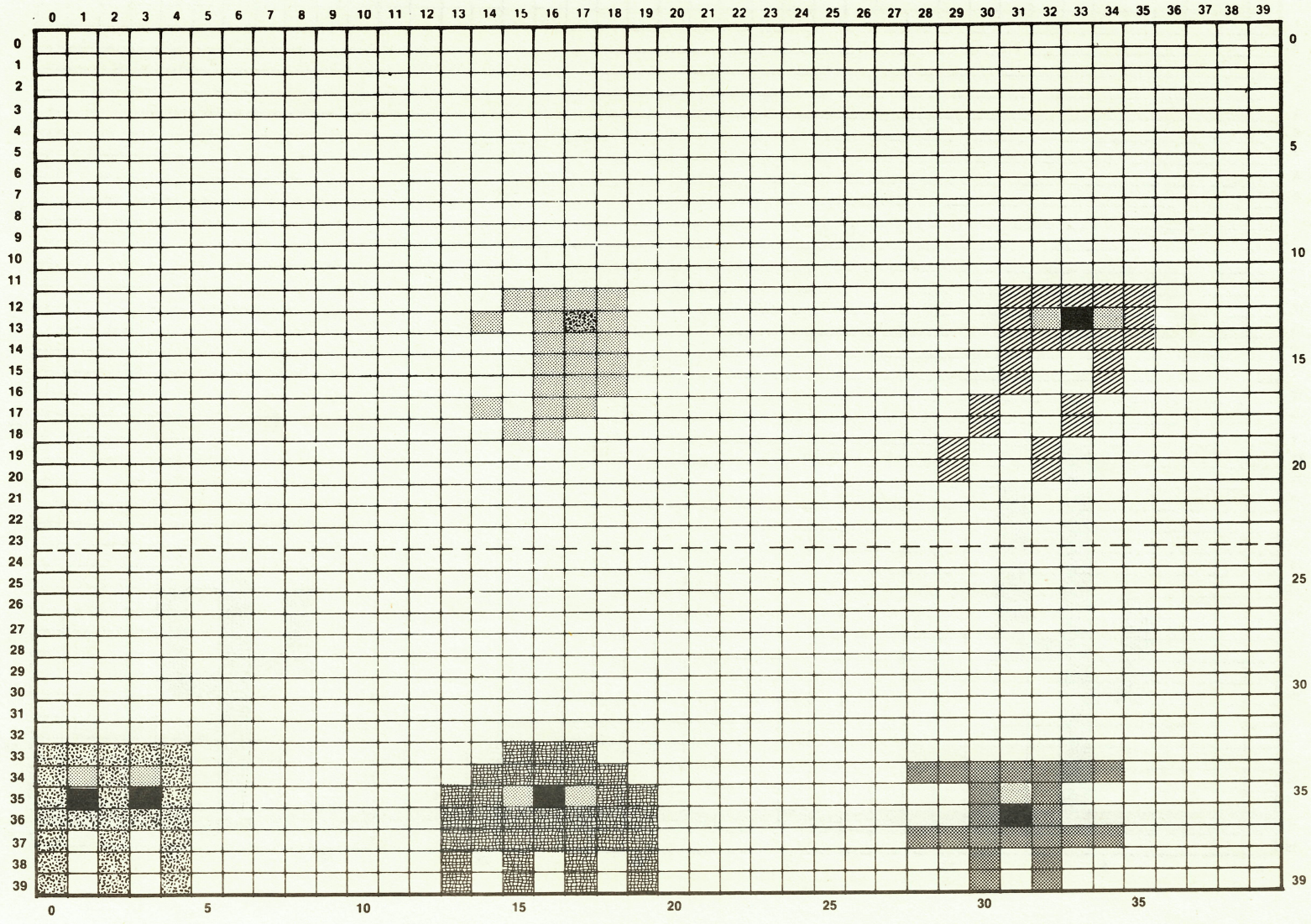
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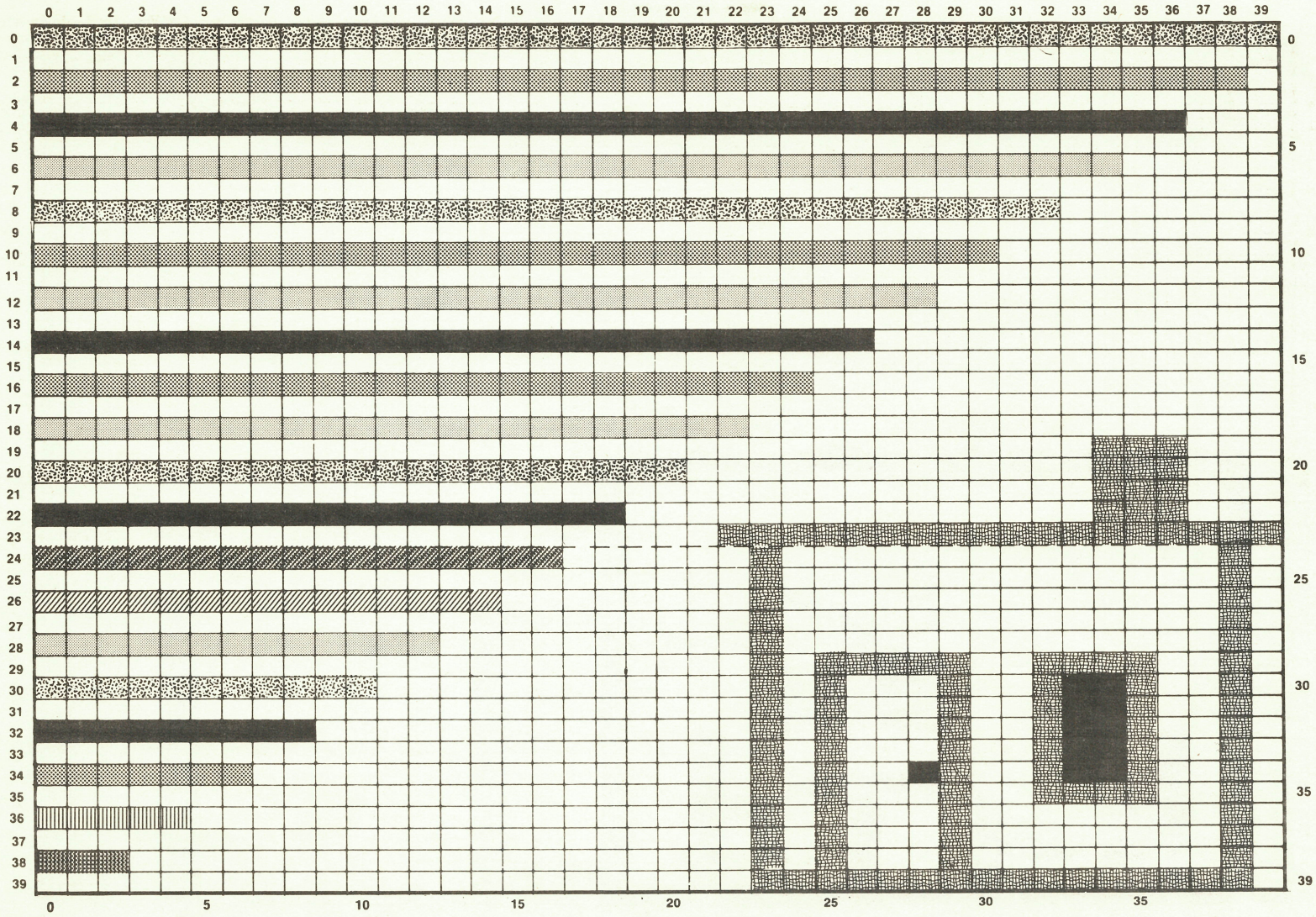
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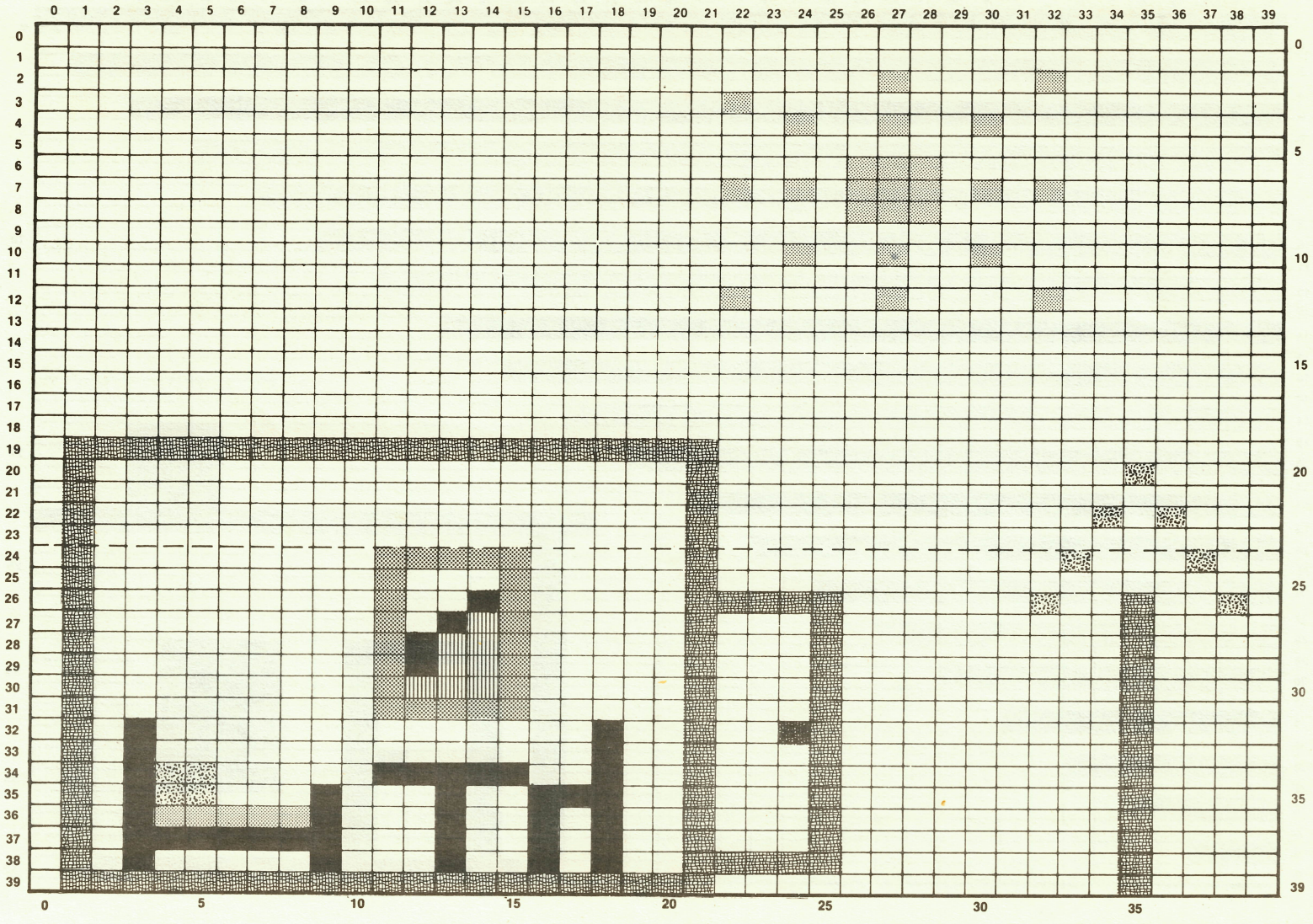
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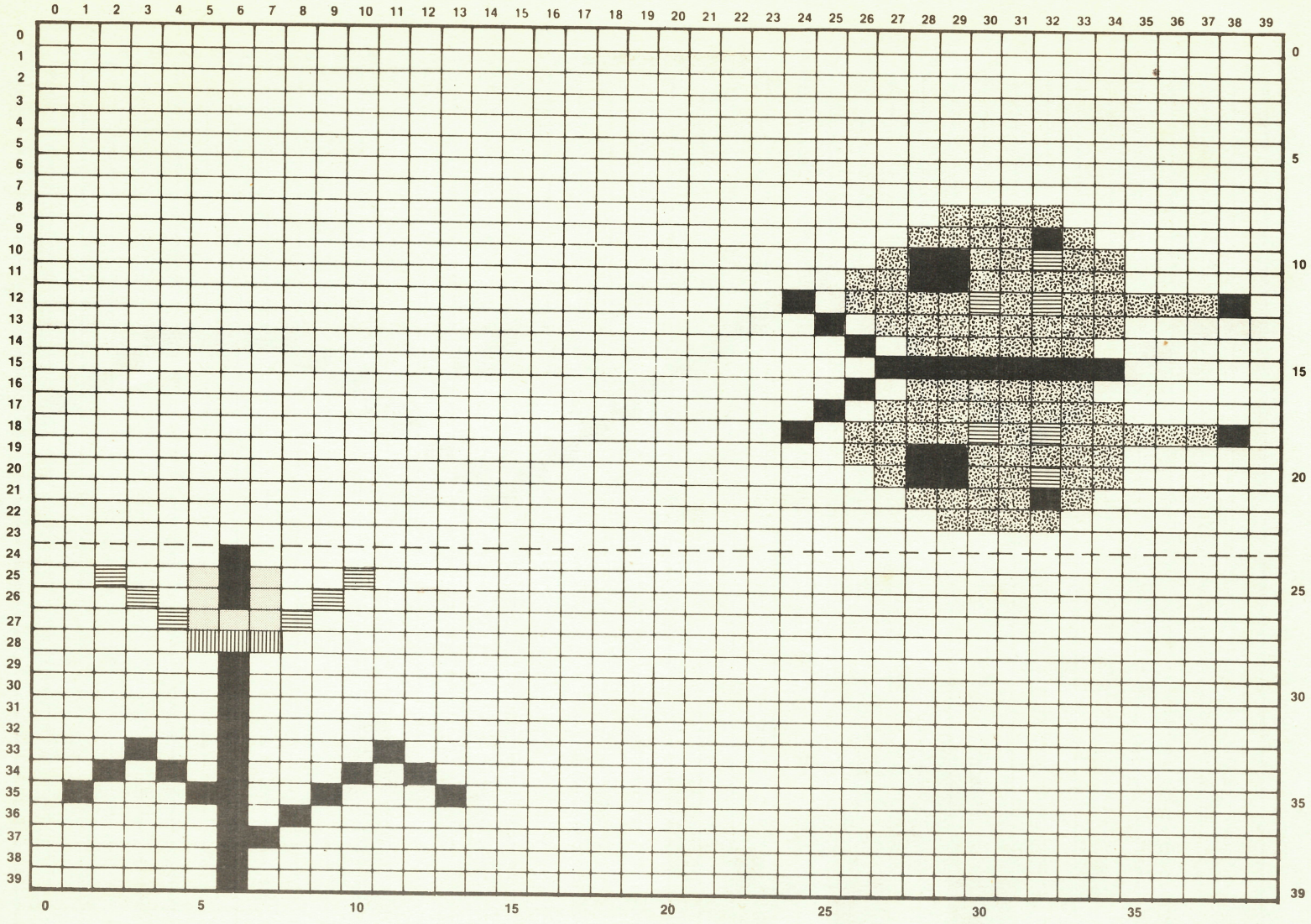

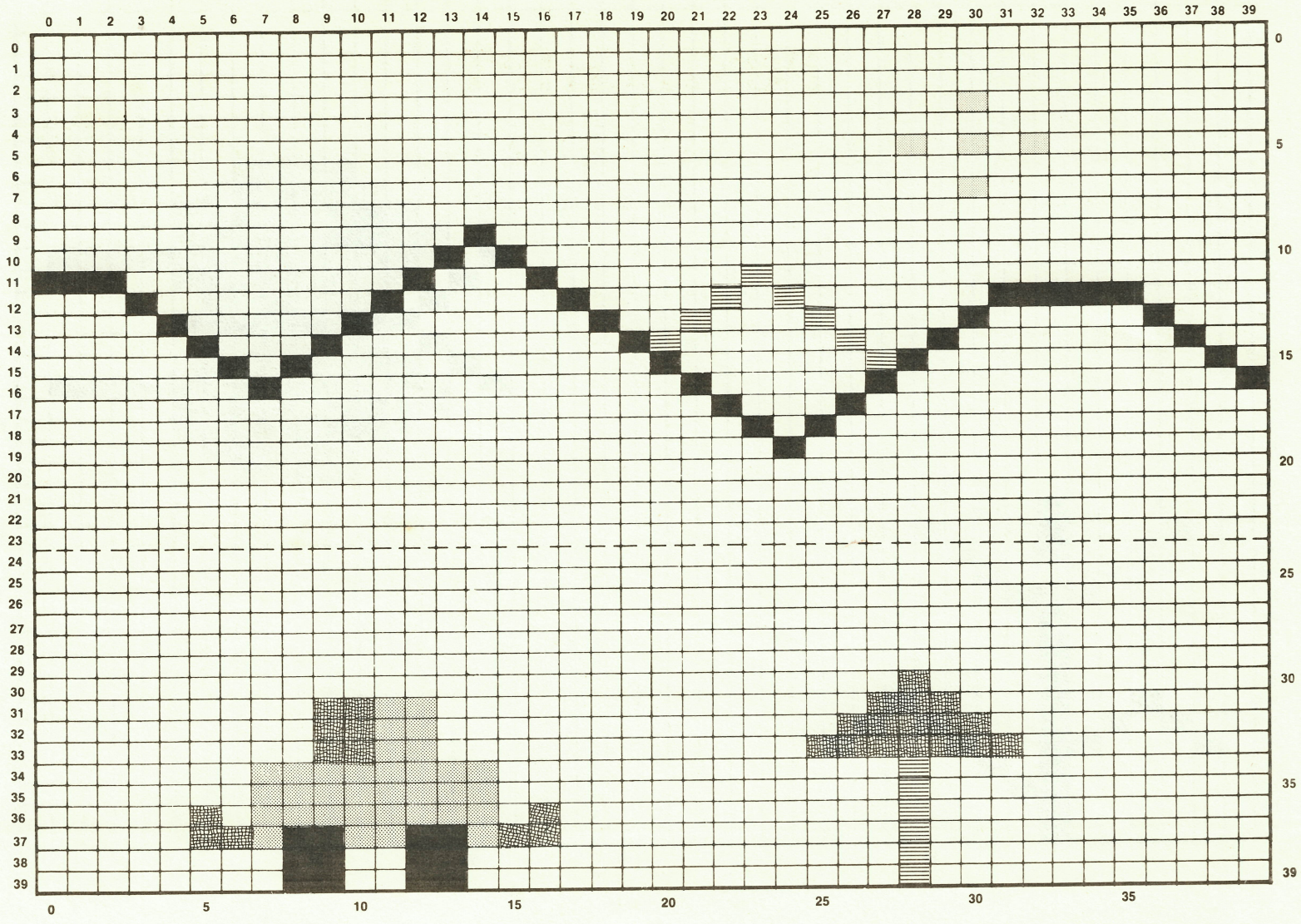
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POSTSCRIPT

Both the author and the publisher of this book are dedicated to providing the best possible materials for teaching kids and other beginners to program and otherwise use microcomputers. We solicit your comments and suggestions. Please let us know what works and we'll try to pass it on to others. Feel free to write either of us at the address below.

Yours truly,

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Royal Van Horn, Author

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